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A PRIMER OF ECONOMIC GEOGRAPHY

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A PRIMER OF ECONOMIC GEOGRAPHY

AN INTRODUCTORY SURVEY

BY

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To
R. G. LYDE

"If the history of every country begins in its physical history, its real geography begins with its economic history."

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PREFACE

This book is only what it is called—a Primer. It does not pretend to be a complete geography; indeed, it treats our largest continent in a very cavalier manner. The publishers have in their catalogue already Mr. McFarlane's admirable *Economic Geography*, which my own students at University College, London, used as their standard textbook, and they do not want another.

But they have as yet no *Primer of Economic Geography* on their list, nor has any other publisher, so far as I know; and I believe that one is needed, and hope that this may meet the need. For, according to the *Oxford Dictionary*, a primer is "a small introductory book," and nothing is more needed than an "introduction" to our subject.

My experience with my own students for twenty-five years in London, and as an examiner in other universities, has convinced me that an Honours candidate who has the right attitude of mind seldom fails to win First Class Honours, even with a relatively small amount of knowledge; but no amount of knowledge seems able to win "Firsts" without a right attitude of mind. That is to say, the attitude of mind is, rightly, far more important than the body of knowledge. There are obvious reasons for this; but, from the examiner's standpoint, I need refer only to two. With the right attitude of mind the burden of acquiring a proper body of knowledge is incredibly lessened; and a right attitude is the only way of making a little knowledge go a long way. And it is from this standpoint that the book is written.

Throughout, therefore, the whole emphasis is laid on the attitude of mind. Not only is a whole continent more or less ignored just because it is not the most useful for the particular purpose—as one would ignore Africa or Australia if one was throwing one's whole emphasis on historical geography — but no single country is treated with any attempt at completeness.

What is attempted is to suggest four things: (1) how to select essentials, (2) how to approach the treatment of them when selected, (3) the need for treating each unit on its own merits, and (4) the need for making the earth the one ultimate unit; and it is far too small to have any rigid classification of natural regions, such as makes boys and girls describe the climate of New South Wales as of "the China type"—which is perilously near nonsense—and then think—quite sensibly—that its rivers are frozen in winter.

Everywhere, therefore, one avoids any rigid formula, and tries to treat each region on its own merits and as an essential part of the one world unit. And material is taken by preference from the parts of the world that are usually better known, especially Europe and North America. In Europe the political unit is deliberately preferred, as quite familiar and easily visualized; in North America the two large political units are large enough to include very large minor regions, and there these are emphasized. Statistics are avoided, partly because they are practically out of date before they can be printed, and still more because of the immense harm done, especially in school-teaching, by the craze for them. The teacher who is obsessed by statistics should take a long course in historical geography to get width and elasticity.

If the treatment followed here is correct, perhaps the most useful thing that the book could do would be to induce readers to ask themselves systematically *why* subjects or areas or events which they expected to find in it are absent. This, of course, implies that the most important thing of all is the selection of essentials; and there can be no doubt that this is so. At the same time, no one should allow his or her mind to be *forced*. There must be *general* agreement as to what are essentials, but there must be elasticity as to *details*. Students should believe firmly that—so long as they are willing and anxious to take advice and to learn from every possible source—they will probably do best by choosing their own items and following their own tastes, even if these are not theoretically the best possible.

Such independence may be even useful to my little book, and so I will add that, where a rather detailed treatment is intentionally introduced, as with regard to apple-growing in Canada, or "strength" of wheat, or the relation of a political frontier (in Hungary) to economics, I should be most grateful to readers who would send me suggestions for making the treatment —*geographically only*—more complete.

I wish to acknowledge the help, the advice which I have had from my son, R. G. Lyde, on the more important historical details.

L. W. L.

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A PRIMER OF ECONOMIC GEOGRAPHY

PART I

GENERAL CONSIDERATIONS

CHAPTER I

INTRODUCTORY

THE value of Geography to the economist is a double one. It presents the whole physical setting of human activity, and it relates that setting to man as an economic animal. There is rather a tendency to ignore the fundamental fact that, after all, man does live on the earth, and that he is just as much an economic product of the earth as any plant or beast. He may talk, and he does talk—especially as an engineer—as though he was master of the situation. At a recent conference the engineers made some remarkable assertions about their independence of geographical control, especially in relation to railways; but their own contribution to the discussion only emphasized the exact contrary of their assertions.

New York and the Hudson. If New York has five out of the seven most remarkable bridges in the world, that shows how much *more* the city is under the "control" of the Hudson than it was a century ago. It is very improbable that *then* 3,000 persons crossed the Hudson every day to and from New York; to-day nearly 3,000,000 do so. Consequently, the ferries cannot cope with the traffic; even the bridges cannot take the surplus traffic; the tunnels are crowded to excess. Why? Because the Hudson cuts the city off from the main land on the west.

The total cost and upkeep of the ferries, the bridges, the tunnels, amounts to millions of pounds sterling. The engineers have done their best, but they cannot free the city from its relation to the Hudson.

But if the river is a great expense to the city, its valley is a great asset. New York is what it is almost entirely because the Hudson valley, with the Mohawk valley, gives a route to the interior *without climbing* the Appalachian plateau, i.e. a 2,000-ft. climb.

New York is nearly a hundred miles farther than Philadelphia from Chicago, but the New York Central Railway can run longer trains in shorter time at less expense than the Pennsylvania Railway because it has not to climb that 2,000-foot scarp. If engineers are "no longer bound down by geographical chains," why does the Pennsylvania line not run from Philadelphia to Chicago in much shorter time than the New York Central?

The Physical Basis. Geography, on its physical side, deals with all these physical features, examining their distribution, describing them, discovering—with the help of geology—why they are in the particular place, and examining—with the help of economics—their relation to the other terrestrial phenomena, especially the distribution of man. There is throughout a causal link; and, if this is understood, it throws light on all the economic problems, and relieves the memory of a good many burdens. For, if one once *understands* a thing, one cannot "forget" it.

Besides all the inorganic foundations, geography is concerned also with the organic responses—of plant and beast and man. It does not ask whether any particular activity is physiological or mental or moral, but it does concern itself with any and every activity which determines distributions—whether of the wheat plant or the tsetse fly or man. The purely physical conditions are the basis of all. The area is either land or water; if land, it is e.g. high or low, old rock or new rock, and the differences of rock mean differences of soil. These may be very important, e.g. in deciding the quality of a wine, or quite insignificant, e.g. for the growth of a poppy or a buttercup. There are 400 flowering plants within the Arctic Circle.

The business of geography, therefore, is to explain how position, relief, climate, soils, vegetation, etc., cause differences between different regions, and how these differences give rise to differences of products, of opportunities, of types of man, etc. Obviously, the science has to borrow from a number of other sciences, and depends on them to a great extent; but they in turn have to borrow from geography its own proper contribution to knowledge—the scientific explanations of these distributions.

Human Wants. Fortunately, we can restrict our attention more or less in economic geography to the main *wants* of man, e.g. need of food, of clothing, of shelter, of "power," etc.; we may even interpret "wants" as including those things which are not actually necessary simply because we are human beings, but which we have been, or can be, trained to "want." So the vital objects of our inquiry should include: (1) the character and the culture of the different groups of people scattered over the earth; (2) what they need or can be trained to need; (3) of what they have a surplus; and (4) how they can get what they need, and send their surplus to others. Every business in the world really involves these four factors, and they are essentially geographical.

Of course, man is not content in most regions nowadays simply with stark necessaries; he wants conveniences and comforts, and some of them have already become practical "necessaries." But *the class of necessary things* remains the same, though its items may change; and we may confine our attention mainly to "necessaries," especially the great food staples and the other raw materials needed for our manufactures.

Food. We may say at once that far the most important products are the cereals; if man does not live by bread alone, a good many men do live mainly on "bread"—whatever they mean by "bread" in the particular region. Next to "bread" comes another staple food—vegetables, the exact meaning varying again with the geographical position. Next to "vegetables" comes yet another food—meat and fish. Once more comes a staple food in "dairy products," which includes eggs. Fifth come the raw materials which we use for "fuel and power." Raw materials for "clothing" have about half the value of these.

So far, then, as primary production is concerned, food is overwhelmingly important, and a quarter of the world's whole "primary" efforts are concentrated on the supply of "bread." Indeed, from the moral and social standpoint, there is the further vital consideration that, in the poorer lands and amongst the poorer people, the total amount of effort and wealth spent on food, especially "bread," leaves almost nothing for other purposes.

The high relative importance of the raw materials used for fuel and power is due to the fact that heat and power play such a large part in the production of food, clothing, and shelter. Cooking—like lighting—does not consume anything like such a high proportion of the total as transport; and, now that so much of our food supply comes literally thousands of miles—from the ends of the earth—transport may fairly be considered as the most important of our activities next to agriculture. On the other hand, in proportion to the cost of the raw materials the amount of work expended on "manufacturing" foodstuffs is tiny compared with the amount similarly expended on our clothes, etc.; and so we are mainly concentrated in urban groups, and are guided in our political activities by our urban outlook—with a fatal neglect of, or even hostility to, rural conditions.

Relative Values. It is almost impossible to estimate particular products with any precision, even for civilized areas; but, as the same difficulties occur in the case of all, and affect all in more or less the same kind of way, it is just possible to make some relative calculations. And one may venture to suggest that fully 40 per cent of the value of the world's chief products is represented by human food; and probably cattle, mainly in the form of dairy products rather than meat, contribute 14 per cent or 15 per cent. Rice certainly comes next, but with not much more than half the value; and potatoes probably come third. In the more civilized areas wheat is more important than both the rice and the potatoes. Swine come next to wheat, and above maize; but so much maize is fed to swine on the farms, especially in North America, that the maize must be reckoned as the more important, especially as the native production of maize—"mealies"—in Africa cannot be gauged. Sugar and millet ("bird-seed") are distinctly less important than the swine or the maize, but much more important than any other products, e.g. beans, oats, sheep. The only products that compete with these at all are coal, cotton, and "wood"; each may represent about 4 per cent of the world's chief products, while wheat represents fully 5 per cent.

Useful Memorabilia. These figures are given here with some hesitation for fear of encouraging what is a pernicious tendency. Far too much attention and weight are given to statistics in economic geography, especially in schools; and one must try to keep one's mind free from the tyranny of arithmetic.

The most accurate average rainfalls or crop percentages are, in strict accuracy, out of date before they get into print; and for that reason, if for no other, one avoids memorizing them. The only useful "statistical" habit is that of becoming very familiar with a few *typical* figures. To speak with something approaching reverence of a particular temperature as "*about* 50·15° F." is mere pedantry; but there is real use in remembering some facts about 50° F., e.g. that it is a typical temperature throughout the extreme south of Europe in winter, or throughout the extreme north in summer—in west-central Europe in spring and autumn—in east-central as a mean annual temperature, etc.

Similarly, it is very easy to remember that the latitude and longitude of Japan are roughly 30° to 45° N. and 130° to 145° E.—that the core of Asia in the Pamirs is 37° N. and 73° E.—that typical winter temperatures in China are 30° F. in latitude 40° N. and 40° F. in latitude 30° N. So Havana, Calcutta, Canton may mark the north tropic, and Rio de Janeiro, Walfish Bay, and Rockhampton the south. This is probably the only form in which geographical statistics are both easily remembered and worth remembering. They obviously give one very sound standards of judgment, and they have a practical use in giving a certain precision to an answer in examinations.

CHAPTER II

A SEA-FISHERY

GEOGRAPHY, of course, is a study of the surface of the earth in all its vast variety, repeating on a huge scale the infinite variety that one may see in any little English county. But nothing is really geographical which does not interest you, not merely in mountain and plain, river and sea, wind and rain, but also—and mainly—in the way in which these features affect man or are affected by him. The mountain is the home of the highlander, the river is the haunt of the fisherman, the plain is the field of the farmer; but man tunnels the mountain, dams the river, and tills the plain, to satisfy the needs of his life.

Our own land gives us quite enough variety of experience to suggest some idea of the main relations between man and the earth on which he lives, and it is always best to work from the known to the unknown. We may, therefore, take one preliminary study of the land we know to introduce ourselves to big Mother Earth, and to get some idea of what we mean by the "geographic control" and the "human response." By "geographic control" we mean the tendency of certain geographical conditions to favour certain human results, e.g. sunburn.

Controls—Climatic and Physical. Even in our own islands, in dry, hot weather, people get sunburnt, especially on or near the sea, where there may be very strong reflection of the sunlight off the water; indeed, one reason for the popularity of such places as Cromer and Llandudno is that, as the sea there is practically to the *north* of the land, there is a minimum of dazzling light off it. Persons with fair complexion often get badly freckled, i.e. burnt, and people who live in lands that are very dry and have very bright sunlight, become in the course of ages black people. Unless you wear a veil, or stain your skin, or keep out of the sun, you *cannot help* being thus burnt.

Now, let us look at a rather different relation. All over the world highlanders have, historically, been involved in a great amount of fighting, generally in steep and difficult places. How much breath can you spare for fighting if you are also climbing? And yet it encourages you to fight if you can shout defiance to your foes or slogans to your friends; and it would be still more helpful if you could have a voice more terrible than any human voice. And so, in a great many mountainous parts of the world, highlanders have invented an instrument with a *reserve* of air, in a bag which can be squeezed by the pressure of an elbow, and capable of making an inhuman noise. This example is not meant in the least to be frivolous, but to illustrate—from the typical Scottish bagpipe—a really important point. Man cannot help being sunburnt, but he was not *forced* to invent a bagpipe—only encouraged to do so by the conditions under which he lived. A geographical control may occasionally cause, but usually only encourages, the human response; the sunburn illustrates what may be called specially a climatic control, while the bagpipe shows the influence of the physical. But both show a relation between the place and the people who live there.

In all these relations it is very useful to try to get back to the prime and vital controls, ignoring the minor; and, if we ask what has been the prime and vital control in our own land, the answer must be its insularity.

Because it was an island, it could be reached only by sailors, by people who did their business in great waters. They must have lived on land, but moved by sea, and very likely got most of their food from the sea. Let us think of them as sea-fishermen. Then, if we analyse correctly the conditions under which they lived and worked, we ought to get some light on why they were the kind of people that they actually proved to be.

The Marine Influence. There are obviously three things to notice—the land on which they lived, the sea in which they fished, and the people themselves; and the distinguishing factor is apparently that, unlike the mass of the world's population, they depended for food on the sea rather than on the land. What, then, favours the existence of a natural fishing-ground in any sea? The answer is that the three main "controls" are the depth of the water, its temperature, its movements.

All the great sea-fisheries are in shallow water. Why? Because, if the water is much more than 100 fathoms (600 ft.), the sunlight cannot reach the sea-floor; and in that case there can be little or no plant life such as is of vital importance to fish life. These shallow seas should also be in temperate latitudes—for two reasons: these latitudes produce the best kinds of food fish, e.g. cod and herring, haddock and mackerel, etc., and favour social kinds of fish; a herring is much better food than a shark, and herrings move in millions, not in ones and twos.

This is a very important point. Hot latitudes are nearly always scenes of senseless competition instead of sensible co-operation, and so give solitary rather than social types of plant and animal. If in a jungle you find one wild rubber tree, you are not sure, you are not even likely, to find another close by; but if in the temperate zone you find one wild fir tree, you are very likely, you are almost sure, to find a thousand more in the same neighbourhood.

The movements of the water, whether tides or currents, are equally important, especially in the case of currents of different temperature. A cold current will bring the best fish, but a warm one will bring the best food for them—the plankton. A very cold current may, of course, bring icebergs, as on the Newfoundland Banks, and so cause great danger both from the bergs themselves and from the accompanying fog. But they carry with them quantities of "rock" from the land on which they were originally built up, and from which they broke away; and when they come into a warm current, they melt and then drop on the sea-floor the whole load of debris, thus making the sea shallower. So there are both warm and cold currents meeting over most of the great fishing-grounds, e.g. off Newfoundland, off Japan, and off the Cape of Good Hope; and as all these grounds are crossed by busy ocean-routes, there is constant danger both to the fishing-boats and to the liners. Thus, the *Titanic* was on a "short," i.e. a northern, route at a time when the ice is not "fast"; and at such times liners ought to be compelled always to keep on the southern route, even though it is longer.

North Sea Fishery. There is no question of different temperature in the tides, nor is there danger of fog; their importance is mechanical. In the North Sea there are two tides moving in opposite directions, one southward and the other northward. Owing to the earth's rotation both are swung to the right of their course, i.e. the southward tide against the British coast and the northward against the Scandinavian. The result is a sort of circular movement—southward, then eastward, then northward, round the sea; and this tends to sweep sand and silt up to form the Dogger and other banks, and to carry the eggs of the fish along with it. The eggs of all important fish, except herring, float; the fish spawn in early summer, when most food is being brought into the sea; and at the same time the melting of ice in Norway and the Alps sends a great deal of cold *fresh* water into the eastern and south-eastern parts of the sea. This tends to drive the fish westward into the salter water, and so most fish are found, and most eggs are spawned, on the British side of the sea.

The circular current carries these eggs across the sea, and they hatch on the way, and arrive off the European coast as immense swarms of tiny fish. Vast stores of food for them come down the Rhine and Scheldt and Maas, but even so, scarcely enough for the millions of feeders; and the largest and strongest seem to move westward, i.e. to the British coast. These driftings of the best fish towards our coast had, no doubt, much to do with the start and the progress of our fishing in early days.

Many people, especially historians, resent any attempt to attribute any "causal" influence to geographical "accidents"; but any scientific thinker, while careful to avoid the pregnant word *cause*, is fully conscious of the extent to which geographical conditions are favourable or unfavourable to courses of human action or development. And, without any thought of cause or accident or anything except a perfectly natural sequence, we may consider what conditions of life are implied—for man and woman—in the normal events of a sea-fishery.

The Emergence of Democracy. The men are away fishing for some hours, or some days, or some weeks, or even for months. While they are absent, the women must be responsible for everything on shore. When the men at length come home, tired out with hard work and long night watches, they are not competent at once to take up the reins of government, for they do not know what has been happening, nor are the women prepared at once to lay down the reins. There must be a spell of overlapping, of co-operation, of *sharing* all the responsibility. And so in all typical fishing people we find a marked toleration of the weak, a marked sex-equality, and other influences tending to a rise in civilization as measured by the position of women. Here is surely a direct human "response" to the obvious geographical "control"! There is no crass Salic Law amongst such people, and their history—from Japan to Britain—shows us a sequence of great queens, from the Empress Jingo and Queen Teuta to Boadicea and Elizabeth.

The boat, too, as a rule, was jointly owned, but the four or five owners chose one of themselves—often in turn—to be skipper at sea, and obeyed him instantly in emergencies, without thinking that obedience was beneath their dignity or meant slavery or inferiority—as so many stupid and conceited persons think to-day.

It was out of this disciplined equality—with its tolerance, its self-respect, its common sense—that real democracy emerged, giving every boy and girl the chance of realizing the best that they were capable of realizing *so long as* they did not believe that they could demand "rights" from their community without accepting "duties" to it.

Where is there any such real democracy to-day?

CHAPTER III

LABOUR

The subject-matter of geography is really the same whatever the particular standpoint of the geographer may be in a particular study. But we have distributions of physical features and of living organisms, and we may investigate the relations of the two at different times. Physical geography—the distribution of land and sea, highland and lowland, heat and rain, soils and minerals—is always the essential base; but historical geography studies the particular development of a particular people in a particular area, and political geography relates national characteristics to natural conditions. The essentials are the same in both cases; we study in turn the position, the relief (i.e. physical character of the land), the climate, the resources, and then the people. There are, of course, little differences of detail, in the choice of facts, in their interpretation, and in the order in which we take them. At one time an island may be important mainly because it is safe from foes, at another because it offers facilities for cheap and easy commerce.

But in early times the permanent inhabitants of every natural region were *forced*—in order to get a living—to adopt certain habits and occupations, e.g. build houses for shelter and catch fish for food. Obviously, these habits and occupations were concerned mainly with means of sustenance, and they crystallized in time into national characteristics and special ways of living. In other words, the number, the distribution, and the habits of a people depended really on their economic resources; but, historically, man used first what came naturally to his hand. So political, historical, and economic geography are simply different and often overlapping ways of studying the same essential phenomena.

Our Proper Aim. What, then, is the proper work of economic geography? It is certainly *not* to collect multitudinous statistics as to where products are found, or produced, or exchanged. The figures are only a great burden on the memory and little help to the understanding. One's object is an attitude of mind, not a body of knowledge. If one gets the right attitude of mind, and learns to think geographically, all sorts of details—statistical and otherwise—stick in one's memory automatically; but no amount of statistical knowledge by itself teaches you, or helps you, to interpret and to forecast. The vital questions are "how" and "why," not "what" and "where."

The proper work of economic geography is, then, to study *how* man makes use of the earth to supply his material needs—how he uses the advantages of any region, or struggles against its disadvantages; why a land lacks certain things, and has a surplus of other things. It should present the world as the home of man, where one region and its people depend on another region and its people; each has something to give, and wants to get something. And each type of man and region should be doing its own proper work, i.e. what it can do best, and minding its own business. For instance, Canada *could* supply three out of every four persons in this country with all the bread that they eat, and four out of four with all the cheese. Russia never could do either; indeed, for the last forty years Russia has never had enough bread for her own people —though millions of tons of wheat have been exported —and thousands of Russian children have died every year from starvation. People do not believe statements of this sort, but it is only because they are profoundly ignorant of economic geography.

Our Proper Reward. Economic geography is, also, easier to grasp than either historical or political geography. It is much easier to understand how climate affects plants, e.g. how lack of snow ruins crops of winter wheat in Russia, than how it affected the civilization of Athens 2,500 years ago, when she turned out in one century twelve men, all of whom stand in the first twenty on the world's roll-call of art and literature. It is also the most useful as well as the easiest to grasp; for it has a real cash value in business, it keeps your finger on the pulse of the world, and so it widens your outlook and your sympathies—you make a much better citizen.

Obviously, amongst the great problems of economic geography are such things as labour, products, routes; and in each case we want not merely to know, but to understand, the essential facts. Mere knowledge is relatively useless. For instance, we want to know *why* labour is so largely a human response to a *climatic* control.

Climate and Labour. Climate decides most of the natural occupations and opportunities of man, and often even how he normally and naturally uses these opportunities. Thus, historically—in times when men's work was done mainly out of doors, and when artificial light was very poor—labour was favoured where there was a long winter day, and thus little need for any artificial light. (Our "summer" time illustrates the same idea, though we get our summer time in a very stupid way, which pretends that the sun is wrong, and which no one but a politician would ever have invented.) And a long winter day is found only in low latitudes, i.e. rather near the equator. But labour was also favoured where the summer day was not very hot; and the summer day in low latitudes is very hot. Obviously, then, labour was going to be most favoured in neither high nor low, but middle latitudes, where there was a fairly long winter day with a fairly cool summer day.

Then, it is a great advantage if the climate allows a maximum percentage of outdoor work at all seasons instead of crowding it into one season; and this is possible only where there is neither great heat nor great cold. The absence of great heat allows man to do hard muscular work in summer without undue exhaustion, and some degree of cold encourages him to do it in winter in order to keep warm. These are perfectly obvious things, affecting only the bodily comfort; but, if they are true, why should not climate affect man also in other ways that are not physical? Why should it not affect his mind and his *moral* as well as his muscles?

Perhaps it does. Certainly an annual winter encourages thrift and foresight, for he must look ahead, and save up food, etc.; an eternal winter, as in the Arctic or Antarctic regions, condemns him at the worst to despair and at the best to sheer endurance. As a matter of fact, the Antarctic continent has neither plant nor animal life, and, therefore, man cannot live there at all. An annual summer brings reward for toil and so hope, but an eternal summer makes man lazy and improvident. When there is no variation of season from year's end to year's end, and when Nature provides abundance of food, why should man look ahead? Why should he work? The cycle of life is twenty-four hours.

Types of Labour. These mental and moral qualities are bound to be reflected, then, in the type of labour.

The *best* labour comes from the temperate zones, which harden without exhausting, and where Nature rewards you for work, but where—in the absence of political interference—if you will not work, neither shall you eat. And it is specially good when it comes from lands of varied relief—mountains and plains, with forest and grassland; then people are accustomed to different kinds of work, and so are more versatile, more useful generally. The *worst* labour comes from extremes of heat, especially damp heat. Extremes of cold keep man very hopeless, but he must be ingenious and brave and enterprising—like the Eskimo—or he could not survive at all. *Most* labour comes from the plains of middle latitudes, such as the plains of the Ganges, the Yangtse, and the Nile, where there is naturally a huge supply of food, e.g. rice, and where this encourages a dense population. But most of this labour is too cheap and too uniform; the people are so badly nurtured that they are poor workers, and they can do almost nothing except dig. For instance, they make wretched coal miners in India.

Of the three areas mentioned, the Yangtse is much better than either of the others; and this is due to the climate. The Assuan dam in Egypt stands practically on the tropic of Cancer; Hindustan is farther from the Equator, but the huge Himalayas shelter it from the bracing cold which it might have in winter, and frost is almost unknown. But the average temperature during January in Hankow is the same as in London, so that the people have a bracing winter; and, as the average temperature during July is twenty degrees higher than that in London, they have a very trying summer. Further, the winter is dry, and the summer is damp. The Chinese find it fairly easy to work, then, in a great many kinds of climate.

Geographic and Non-geographic. We must be cautious, however, about not overlooking factors which are now *not* geographical, though they have been a response to geographical controls in the distant past. For, in the effort to adjust themselves to their environment with maximum results, peoples may be greatly helped by "racial" gifts. The character of the land and the climate, the presence or absence of fuel and other resources, the position in relation to other lands and other peoples, are all obviously geographical.

The purely geographical field is very wide because human life has so many aspects—social, economic, political, etc.—and can be affected by its environment in so many ways; but, once the whole world was known, and international relations and movements became world-wide, migrants carried to new lands instincts and aptitudes which were associated—perhaps as a response to the inorganic control—with quite different conditions. These instincts and aptitudes, of course, affect their attitude to the new lands—sometimes adversely. For instance, Europeans have often built houses with corrugated-iron roofs (quite suitable in Europe) in tropical lands, where that may mean death.

In our present inquiry these minor incidents are insignificant. We are only discussing the obvious geographical relationships, and need to emphasize only the actual fact, e.g. that the Chinaman can work well in almost every kind of climate, and that he is, or may be, therefore, both a very useful helper and a very dangerous rival.

The variation of food-staple from place to place, to which reference was made above, is mainly due to variation of climate; and, of course, it is not in any way restricted to cereals, but extends throughout the whole of both the vegetable and the animal kingdoms.

The result is that a particular region presents a series of related phenomena which mark it off from other regions, and this has led geographers to pay special attention to, and lay great stress on, what are called Natural Regions.

The late Professor Herbertson, our greatest geographer, suggested an elaborate scheme of such natural geographical regions, or major natural regions, on a basis mainly of a certain unity of temperature and seasonal rainfall, associated with configuration and vegetation; and thus he stimulated much useful work. But the scheme was much too rigid for a single small world; and, though his great reputation led to its being widely adopted, even in school work, it caused a good deal of misconception. Thus, all eastern margins in warm-temperate latitudes were made to bear the label "China type"; and so children came to believe, for example, that Natal and New South Wales had "Chinese" winters, with frozen rivers and other phenomena typical of the lower basin of the Yangtse in winter.

The general idea was not new, only its application. Supan had suggested a scheme on a purely climatic basis, and Köppen one on a botanical basis, and many suggestions had been made of broad classifications, especially on a climatic basis. All these suggestions had been useful and stimulating; but in economic geography the most useful thing is to study the whole region as a complex, with its complicated collection of phenomena of all sorts, all in some way akin to and in some way differing from phenomena in neighbouring regions.

PART II—FORESTS

CHAPTER IV

NATURAL REGIONS

A NATURAL region is simply a division of the earth's surface which is naturally different from other neighbouring divisions; it has a certain unity inside it, and certain differences from the outside areas. The deciding factor may be relief or climate or a particular product, but it is seldom possible to isolate a special factor, and there is usually a combination of factors (cf. p. 19); and in any case, the ultimate result, e.g. desert, or grassland, or forest, is the important thing, for it suggests a natural division of labour. Each area ought to produce just what it is best suited to produce; then the particular product should be abundant, of fine quality, and cheap.

The greatest drawback to practical work on a basis of natural regions is that it is so difficult to delimit them. There are rare cases in which, e.g. at the foot of the Andes or on the seashore, there is an abrupt change from one type to another; but in the vast number of cases there is no sudden change, only a very gradual transition. The change, indeed, can be noticed at first, as a rule, only in a slight change in the typical vegetation, e.g. the appearance of plants which are equally suited to summer drought and summer rain. And the transition areas are of special interest and value just because we can study in them the ways in which plants *begin* to adapt themselves to new conditions. Obviously, when natives of summer drought are first transferred to areas of summer rain, they are likely to suffer from mildew and rust.

Political Regions. On the contrary, the limits of political units are definitely known and, as a rule, carefully marked; and statistics of production, etc., are published mainly by the individual units, though wide surveys may be published by such bodies as the International Institute of Agriculture or the British Cotton-growing Association. And most of our ideas are connected with political units, e.g. France or China. The result is that in actual practice we have to make much use of the political unit, and the one necessary precaution is to begin by learning to visualize the particular unit as a collection of *minor* natural regions, while it is itself inside a larger—perhaps much larger—*major* region.

Tundra. Again, for practical purposes, we may, and even must, pay far more attention to some natural regions than to others, e.g. mountain and polar regions. The Tundra, or cold desert, of polar regions is of very little use to us at present, and we can easily concentrate our attention on any particular aspect of it which suggests development. For instance, the tusks of mammoths that ages ago were frozen up on the banks of the Lena, are an important source of fossil ivory; but, of course, the supply is rapidly being exhausted. In most parts of the Tundra, again, man is still engaged in *destroying* the resources of Nature by fishing and hunting; but over the Old World Tundra, and in the Alaskan part of the New World, he is *creating* wealth by pastoral pursuits. We are now actually beginning to import reindeer "beef," and meat has always been the foundation of life on the Tundra, as we may infer from the name Eskimo, "Eater of Raw Meat." Of course, there are no trees there, and oils and fats are needed for warming—as distinct from cooking—purposes, so that the meat had to be eaten raw.

The presence of swamp (breeding myriads of mosquitoes in summer) and the absence of trees are two marked features of the Tundra; but, on hillocks here and there, especially towards the warmer edge of the belt, you may see tiny willows and birches—perhaps twenty years old and two feet high—and these suggest that the next natural region will be one of trees—a belt of temperate forest.

Forest. This forest is for several reasons one of the most important natural regions of the world, including originally far more than half of Europe; and it is well to remember, from the point of view of both history and economics, that the civilization of most of the world has spread from this forest belt. Man is, indeed, an arboreal primate, and, to start with, he was not only a forest-dweller, but actually lived up in the trees, as he still does in some parts of the tropics, e.g. in Borneo. Probably the finest type of man in the world has come from this temperate forest belt, and his forest environment has left its mark on him; and the lowest type has come from equatorial jungle.

"Forest" Climate. What, then, are the conditions which have favoured the growth of the most useful kinds of timber in the world and the development of the finest type of man? The temperature for at least one month in the year must average about 50° F., i.e. correspond with the temperature of an average April day in England, and the rainfall must be at least half as much as we have in the driest part of England. This, of course, is really very little, but this forest belt was once glaciated, and the surface soil is still very wet; and even in the drier areas there is hard frost in winter, and this means a spring thaw, which materially increases the supply of moisture for the trees.

The one great enemy is wind, which is not only actually destructive, but also carries away moisture at times when, because the soil is frozen, the tree cannot replace it; and this means that it dies of *thirst*. At the same time, most of the soil is poor in quality, at all events throughout the coniferous part of the belt; and, again, as the tree can take food only in liquid form, it cannot get food in winter, and so may die of *starvation*. Against both dangers, then, it must be protected. The tree is mainly trunk—in which it "stores" its starch food; its cone-shape protects it from heavy winds; its tiny and leathery leaves transpire very little moisture.

The proper work of this coniferous forest is to produce "wood," and, therefore, to clear it and use the ground for some other purpose is, obviously, foolish; and, with a world shortage of timber, it is almost criminal, especially as the desirable qualities in the timber are, essentially, a response to the extreme climate. For the conifer grows so slowly that it is tough and strong, while "soft" to work; trees which produce "hard" wood, are the products of mild climates.

On the warmer edge of the Conifer Belt we find in most places broad-leafed trees, which shed their leaves in the cold or the dry season, to avoid excessive transpiration at a time when they cannot replace the lost moisture. Of course, just because they have broad leaves, they need far more water, as food and drink, than the conifers; and so they are likely to be found only where there is a good rainfall at all seasons, i.e. relatively near the ocean, as the sole source of all rain. But this deciduous forest has been destroyed even more widely than the coniferous, for it was more accessible, and the soil had been enriched for centuries by the annual fall of leaves; and the only obvious reason for saving it was to maintain the supply of nuts and fruits, e.g. from oak and beech, walnut and chestnut, apple and pear. Throughout the *natural* Deciduous Belt, then, there is not now much continuous forest; and where it has been cleared from hill country, much harm has been done, for the roots both store the rainfall, and so lessen the danger from floods, and prevent the scouring away of soil from the slopes. Generally, however, the cutting of deciduous forest in temperate latitudes is far better justified than that of coniferous forest, because the surface soil in the former is so much more valuable, and because the typical climatic conditions are so favourable to man.

Forest Resources. We may pay further attention to the economic geography of forests. In very early times, at least in England, forests were essentially restricted to purposes of sport, incidentally yielding a good deal of animal food—hart and hind, bear and boar, from the large "forests," and buck and doe, pheasant and partridge, from the "chases" or small forests; and practically all forests belonged to the king, and down to the time of Magna Charta he could extend them wherever he liked.

The food aspect is now practically gone, the animal products of forest being almost entirely in the form of furs and skins, and this "fur trade" is of quite insignificant importance in the economic development of forest. The main and proper use of forest is for the production of timber and other "wood" products, the timber itself becoming relatively—but not actually—less important than various "pulp" products for the making of paper, etc. Much less important than this, but far more vital to the well-being of countries than people believe, is the value of forest in its climatic aspects, especially as exercising a certain climatic influence, and as protecting against injurious climatic "accidents."

CHAPTER V

TIMBER

THOUGH forest spread very widely over the earth in early ages, differences of soil and climate gave rise from the very first to variety of types, and man had only one effective weapon for clearing forest—fire. He wanted it cleared to get pasture for his domestic animals, and burning resulted in the area being covered with potash, and, therefore, providing extraordinarily good grass for this purpose. In recent times, the burning of forest in New Zealand had an exactly similar effect on the quality of the pasture. The greatest aid, therefore, in the economic development of forest in early days has become the greatest danger in modern times.

Temperate latitudes have always been far more important than tropical, because in the former species are social and gregarious (cf. p. 9). In a typical tropical forest hundreds of species may be found on a single square mile, and one might be able to cut perhaps three or four trees of the same kind on that square mile. To deliver a hundred loads of *uniform* timber is, therefore, practically impossible, or prohibitively costly, and a "mixed bag" is quite useless for ordinary commercial purposes. But, in Central Europe, the species on the same area do not number even fifty, and in Northern Europe not ten. The mass of these two areas is low land, and this still more favours uniformity of "cover," for height has the same kind of climatic effect as latitude, only acting much more rapidly.

The change of altitude or latitude affects the timber as much as the trees, but the increase of variety in the outward appearance of the forest does not imply any increased utility in the timber; the contrary is rather the case. Tropical latitudes produce the hardest timber from the least hardy trees, but it is usually the "best" only for cabinet purposes. Really temperate latitudes produce all the "best" constructional timber—from pine, spruce, larch, etc. In the transitional latitudes we find, naturally enough, trees with the merits of both the other classes; oak and ash and beech can be used for both purposes. Indeed, the great heat in the summer drought of the Mediterranean basin gives to walnut, olive, and yew almost as much colour as is found in mahogany, ebony, and teak; and, although not usually quite so hard, they are hard enough to take a fine polish. Further, to protect themselves from the summer drought, several of them secrete a volatile oil; and it is the presence of this oil that allows walnut to be used in connection with iron and steel, e.g. for the stocks of guns and rifles, without any fear of rusting. The winter drought in the lower, i.e. the hotter, latitudes of monsoon lands gives rise to a similar "response" in the case of teak; and so it came to be the regular timber used for men-of-war in the early days of iron ships.

Forest Values. In the economy of Nature the original value of forests must have been what we now call "indirect." In the earliest ages, as we have seen, they were the home of man, providing him "directly" with house, food, fuel, etc.; but as soon as man left the forest, its value became indirect—climatic and scenic. Possibly this is still really the chief use, but very little attention has been paid to it till quite recently.

Obviously, from the geographical standpoint, we have to interpret three factors: the actual bulk and canopy of the tree, the leaves and other debris with which it covers the ground, and its roots underground. The actual bulk and canopy of the tree form an obstacle to the movement of wind and to the penetration and radiation of light and heat; the collected leaf-mould, or humus, protects the soil from extremes or rapid changes of temperature, and helps to store water; and the roots bind the soil together. The result is that the forest tends to make temperature equable, giving a slightly higher average annual rate than in the neighbouring open country; it tends to increase the relative humidity, both transpiring itself and reducing evaporation; it greatly regulates the water supply, preserving springs and preventing floods; it prevents the waste of soil—by erosion of higher land and silting of rivers; and it forms an admirable wind-screen for both crops and cattle. Reckless destruction of forest is, therefore, one of the most stupid things, even from the most utilitarian standpoint; and, if we may give weight to the influence of forest on the beauty and the healthiness of a human environment, it becomes a crime. Unfortunately, the tree which any thoughtless spendthrift —a "jerry" builder or a municipal "crank," the latter a very formidable pest—can cut down in a day cannot be replaced, perhaps, for fifty years.

The direct value of forests to-day lies in their production of wood products, but they represent also an immense amount of capital, and provide a very large amount of work. This, however, does not include at all a proper proportion of actual foresters, the number of trained foresters in the British Empire not much exceeding 1,000, i.e. not one to every 1,000,000 acres of forest.

This direct value, then, is mainly in timber, pulpwood, and firewood, three great necessaries of daily life; and for all these purposes the coniferous forests are overwhelmingly important—so much so that they need special and separate notice.

Tropical Timber. Indeed, for most practical purposes, we may divide the forests of the world into two classes—the broad-leaved hardwoods and the coniferous softwoods; but the former include the deciduous trees of temperate latitudes, which—as we have seen—have some of the merits of both hard and soft types. Unfortunately, of the 11,000,000 square miles, i.e. one-fifth, of the earth's surface under forest, only 35 per cent is under softwood forest; and, even if we count the temperate zone hardwoods with the softwoods, about half the total area of forest is still under hardwoods—tropical hardwoods. There is no anxiety, therefore, about the supply of these. There are, however, some problems connected with these tropical hardwoods. For instance, we know very little about them, and the first thing to be done is to obtain reliable information covering both the vast extent of them and the immense variety of kinds. The next thing is to investigate the possibilities of substituting—perhaps after long and careful scientific treatment—some of the new species for old species which are rapidly running out. Once these two things were done, it would be comparatively easy to make the supplies more accessible than they are at present; and the main difficulty would be to guarantee the supplies being regular and in "commercial" quantities—the one thing which tropical conditions do not favour. Indeed, jungle supplies of rubber have, for that very reason, been beaten out of the field by plantation supplies.

So far as the British Empire is concerned, we are well supplied. In India, counting only State forests, we have certainly 250,000 square miles—far better organized than any other area of tropical forest; in West Africa we have an equal area, though poorly organized; and we have rather more or rather less than 100,000 square miles in the East and West Indies (especially in British Guiana and Malaya), in East Africa (especially in Southern Rhodesia), and in Australia. In all there are, perhaps, 1,000,000 square miles of such forests within the Empire, and at least 25 per cent is both good and fairly accessible.

Temperate Forests. Over 80 per cent of the total area of forest in the world is in the Northern Hemisphere, especially in latitudes 45°–70° N.; and if we confine our attention to the softwoods and the "temperate" hardwoods, the proportion is still higher. Very nearly 90 per cent of the area under "temperate" hardwoods is in the Northern Hemisphere, and fully 95 per cent of that under conifers. That is to say, the mass of the supplies of "commercial" timber is in that half of the world in which fully 75 per cent of the population is found, and this must react on the cost of transport.

The figures become more impressive when we remember that the "mass" consumption of timber is largely confined to civilized, especially industrialized, countries, such as are the exception in the Southern Hemisphere; and such countries are practically the sole users of "cabinet" timber for furniture. Indeed, excluding firewood—a very important item—these countries use only 20 per cent of hardwoods to 80 per cent of softwoods. In Britain, however, which is much the greatest importer, the proportion of softwoods is 90 per cent, and this makes our timber problem very urgent.

North America. Though Britain is the greatest importer, the United States are much the greatest users of timber, and this was of no importance to us so long as they were also the greatest producers of timber. But, to-day, the U.S.A. forests are scarcely a quarter of their old size; first the New England States and then the Lake States were stripped, and now the South Atlantic States are being stripped. The total cut is four times the annual growth, and the only reserves are in the northern half of the Pacific States. But these States are from 2,000 to 4,000 miles away from the great markets of the central and eastern cities; and, as 80 per cent of the total U.S.A. population is in that east-central quadrant, the price of timber is bound to rise owing to both the shortage of supply and the cost of transport. And the latter may divert the U.S.A. demand across the Atlantic—to compete in Europe for constructional timber, as it already does for pulp-wood.

Of course, there is the most important source of supply in the world close at hand in Canada; but the position there is far from satisfactory, for, at the present rate of "destruction," the accessible areas of virgin forest will not last more than twenty-five years. The largest loss is undoubtedly due to insects and disease, which probably destroy 2,000,000,000 cubic feet of timber every year; but the methods of working are so wasteful and destructive that, for every 9,000,000 cubic feet actually used, 8,000,000 are wasted! This means a total annual waste of 800,000,000 cubic feet; and as a similar huge amount is lost every year by fire, the outlook is far from cheering. It also explains why "the brilliant idea" (!) of having our timber cut during the war by Canadians was so horribly wasteful.

Europe. Obviously, then, the position in Europe is going to be difficult; and here, again, the conditions of production are very unsatisfactory, especially in Russia, where nearly every one believes that there is "untold wealth of timber." Much the same is believed about Scandinavia. But Norway has for years been "living on her capital," cutting fully 50,000,000 cubic feet more than the annual growth, and Sweden has been over-cutting by 100,000,000, though in both countries now the danger is being fully recognized. About Russia we have no reliable information whatever, either about her population (probably equal to that of the U.S.A.) or about her consumption of timber; but even before the war she was *importing* timber via the Black Sea, and her consumption was probably 2,000,000,000 cubic feet *above* her annual growth. It is profoundly unlikely that the position is any better now, and almost certainly it is much worse.

Asia. What is said about Siberia is still more dubious, and—from the standpoint of economic geography—much of it is merely nonsense. There is, of course, a vast area of forest—very nearly all of it Tâiga, i.e. coniferous—in Siberia; but the only part that is capable of development at present, is that in the Pacific hinterland, and even this is accessible only along the sea and the rivers, and very little is known of its extent or its quality. There are, however, obvious facilities for shipping, e.g. to Australia. In Central Siberia there is probably a large amount of good timber, but it is not marketable at present or likely to be so for years to come. In Western Siberia the actual area of forest is very great, but the conditions of both growth and transport are very bad, and there is probably little *good* timber at all.

The reasons for this are essentially geographical, and are worthy of consideration. The Ob basin was—not *very* long ago—a gulf of the Arctic Ocean, which was gradually filled up with alluvium brought down into it by the "Ob" rivers. After the gulf had been thus filled up, the swampy alluvial land was covered with ice during the great Ice Age; and thus the waterlogged soil was covered with a great sheet of frozen water. The result of all this to-day is that the area is largely a vast expanse of swamp, frozen for nearly half the year. Such land *cannot* produce good timber, not even good spruce. And, whatever is published as propaganda about this area, so far as the quality of the timber is concerned, is unquestionably false.

But this is not all the story. Owing to the great expansion of the area in latitude, spring comes much sooner in the south than in the north, and the rivers are actually in flood in the south while they are still frozen in the north; and the flood water, unable to get under the ice, pours over the banks, and spreads out for miles along both banks, to the great detriment of any forest. Even when the whole river system is free from ice, flood water continues to come down into it, from the Ural and the Altai mountains; and, as the land is almost dead flat—Semipalatinsk, 2,000 miles up the (Irtysh tributary of the) Ob, not being 400 feet above the sea!—the river cannot carry silt far, and so this is deposited in the bed and on the banks, raising both, until even the *bed* of the main stream is *above* the level of the land beyond its banks. This means, of course, that in many places it is impossible to *float* the timber from the forest *up* on to the river; and floating on melted snow is the only cheap way of moving timber. Thus, the quality of the West Siberian timber is bound to be poor, and the only cheap method of transport can seldom be used.

The total result of our survey seems to be that only in Finland, and possibly in the new Baltic States, is the cut of soft timber not greater than the annual growth, i.e. not a suicidal operation; and even in Finland the annual growth in the north is probably *less* than it is at present assumed to be, and the sawmill industry has been growing very rapidly—largely in response to British demands. The total exports of Finland till recently were double those of ten years ago, and about 60 per cent of the total is contributed by timber, and about half as much by paper and pulp, i.e. a forest export of nearly 90 per cent of the total trade. In the Baltic States the felling is very wasteful, and the replanting is quite insufficient, but the lack of capital is minimizing the exploitation of the forests; and—according to Dr. Haensel, late of the Commissariat of Finance of U.S.S.R.—the export of timber from Russia *below cost price* is directed against the Baltic States, which have been recently our chief source of pitwood, and have balanced their budgets solely through their exports of timber.

CHAPTER VI

AFFORESTATION

THIS survey of forest distribution is suggestive. It suggests the value of economic geography to a practical business man, the need for reafforestation of old forest areas, and the immense reward to the discoverer of any substitute for wood, e.g. for papermaking, and of any means of using hardwoods for "softwood" purposes. Either of these woods may be associated with some other distinct development, e.g. the use of jungle products for the production of industrial alcohol.

We may comment further on each of these three propositions. Economic geography lays down quite definite rules about the conditions necessary for the growth of good timber and for the cheap transport of any timber. If the conditions in any given area are adverse to quality or cheap transport, no credit, still less any importance, should be attached to the assertions of politicians or the publications of Government offices to the contrary. They may be dismissed as merely propaganda. On the other hand, reafforestation became an urgent practical problem in many countries, especially Britain, during the war. Apart from the submarine campaign, the importance of food and the bulky character of timber alike minimized the amount of shipping that could be spared for the timber, even though immense quantities of timber were needed in the various theatres of the war. The obvious result was wholesale destruction of our home supplies, followed by a serious scheme of reafforestation—2,000 square miles of poor "unplanted" land to be forested within forty years, with a proper forest service; and this will presently give great encouragement to small holdings by providing work in the forests at a time when little or no agricultural or horticultural work is pressing.

Unfortunately, the cutting of the home supplies was largely entrusted to Canadians, as the most skilful cutters; but, however skilful as cutters, they were in no sense foresters, and their wasteful methods have left us with a very serious problem in many parts of the country that were well-wooded before the war. Things generally would have been much worse than they were, especially in the eastern theatres of the war, if it had not been for India. There has been an admirable forest service in India for fifty years, and the eastern theatres were largely supplied from India, but in normal times 85 per cent of the Indian export consists of teak.

Apart from the direct timber value of forests, especially in temperate climates, there are many other valuable products, especially in tropical climates, e.g. dyes and gums, oils and saps—various kinds of rubber being the most important; and leaf-mould and other "manures" are vital for the successful growth of many crops. Incidentally, too, there is a wide demand for labour—in actual administration, in transport work, and in the industrial conversion of the various raw materials, e.g. for tanning or chair-making.

Transport. The bulky nature of most forest products and their relatively low value complicate the transport question; and, obviously, the most favourable conditions are found where heavy snow occurs in countries with great rivers. All such countries must be relatively near the sea, i.e. the source of all rain, or there could not be heavy snow; and this implies conditions favourable also to the growth of forest. It minimizes also the purely climatic value of the forest cover. Conditions, therefore, of growth are best where there should be also the best conditions of transport, and where there is no climatic reason for not felling much timber (cf. p. 24). And thus regularity of supply is guaranteed —a vital point, and one which has been a main cause in England of our preference for "foreign" timber. Of course, in England, as in France, a large proportion of our forests has been historically "navy" oak, and this is not very useful. But the great drawback has been the smallness and the irregularity of the consignments—whatever the particular kind (cf. p. 27)—reaching the market, contrasted with, for example, those of Weymouth (i.e. "white") pine or even of spruce and Douglas fir in Canada. Indeed, reckless destruction has stripped Canada of white pine almost as completely as goats have stripped large areas of the Mediterranean basin of almost every kind of timber.

Forest Clearings. Obviously, clearings bring a great deal more variety into forest life, especially in temperate climates. Clearings in tropical forest are generally covered—with inferior growths—in a very short time, and agriculture is done chiefly by women, and largely confined to the raising of such "forest" products as bananas. These grow almost without any care or labour, and certainly demand no steady effort to ensure an abundant supply of food. So-called clearings at the *edge* of the forest need rather more care, and produce such crops as maize and beans. In the temperate forests, especially in the higher latitudes—where, of course, the trees are seldom deciduous, except, e.g. for birch and willow—many useful crops can be grown, and the long day compensates for the short season; but life is hard, and the food supply is precarious, sometimes including even "flour" made from bark, e.g.

birch bark. The supply of animal food, from both land and water, is much larger and more wholesome than can ever be collected in wet jungle, and hardy grains such as rye, barley, and oats, are very nourishing, and mean a less precarious basis of existence. These crops are, however, like the jungle-edge crops, intended solely for local consumption—by labour occupied in other, especially in true forest, industries, and so they do not enter into commerce at all.

The main exception to this general rule is probably in the case of hardy fibres, i.e. flax and hemp, and hardy roots, e.g. potatoes and turnips, but even these are harvested with some difficulty, especially when there has been a late spring, and only the fibres are likely to enter into commerce. The need for ingenuity and for strenuous labour has helped in developing a very fine type of man in the forester.

PART III

PASTORAL GRASSLANDS

CHAPTER VII

GRASSLANDS

THE greatest of all vegetational contrasts is that between forest and grassland. The forest tree is the longest-lived, the grasses are the shortest-lived, of all plants; and forests are associated specially with abundance of moisture, and that more or less evenly distributed throughout the year, while grasses are associated specially with deficiency of moisture, the available supply being usually concentrated in a single season. There is likely, therefore, to be a certainty in the forest environment and an uncertainty in the grassland environment; and in each case we may expect the particular factor to affect the lives of the inhabitants of the particular area.

Except in real desert, hot or cold, there are no regions where there is too little warmth or too little moisture for some grasses to live. Quite a little of both is sufficient to germinate the seeds, and quite a short time is sufficient to make the plant grow, flower, ripen, and drop its seeds; and when it dies, its rotting leaves and stalk cover over some at least of the seeds, and preserve them safe for the next combination of warmth and moisture.

The amount of moisture needed depends on the average temperature. When the temperature is high, and so evaporation is rapid, more moisture is needed.

On the other hand, where the temperature is low, the ground is sure to be hard-frozen in winter; and then the spring thaw may give quite enough moisture to start the plant growing, even without any rainfall.

At the same time, all rain must come ultimately from the ocean, and be carried by wind; and the farther we get from the ocean, or the more we are cut off from the ocean in any way, the less rain we shall have. We shall find grasslands, then, naturally in the heart of large areas of land or even in small areas which are somehow or other cut off from all rain-bearing winds. We should expect, therefore, to find the vastest grasslands in the hugest continent, i.e. Asia, but we may find large grasslands where a high range of mountains cuts off rain, as in North and South America. Africa, as coming next to Asia in size, probably also has vast areas of grassland.

Kinds of Grassland. But, though all these areas are properly called grasslands, they are not the same kinds of grassland; the kind alters with latitude and with altitude, and the right name changes with the kind. Nearly all the grassland in Asia is low and in temperate latitudes, and all of it is called—much of it rightly called—steppe. Nearly all that in Africa is high and in tropical latitudes, and it is called savanna; it might be called, as in tropical South America, campo in the higher parts and llano—or even pampa—in the lower.

Unfortunately, the word steppe has come to be used improperly. Even the late Professor Herbertson quoted that it denoted "unwooded tracts in middle latitudes, of considerable extent, and covered with useful vegetation"; and he added that it was "a convenient term to describe those lands whose treelessness is due to great extremes of climate, produced by their remoteness from the ocean." Even though every word of this explanation is true, both the description and the explanation are rather misleading.

The Russian word *stepe*, or *stapi*, really denotes "waste," and was originally almost certainly applied to the vast areas in Russian Asia where the conditions are semi-desert! These areas are in middle latitudes; they are treeless; they are of great extent; they are "covered" with vegetation that is of some use—even if only for camels; they are far from the ocean, and, therefore, they have extreme climates. *But* there are greater extremes within the limits of the Asiatic Täiga; Verkhoyansk, with an average of – 60° F. for three consecutive months, and then an average of + 60° F. for another three, and with extremes below – 90° F. and above + 90° F. is *surrounded by the coniferous Täiga!* The steppe, therefore, can scarcely be due directly to extremes of climate.

Steppe Climate. To what, then, is it due? To two factors—wind in the dry winter and lack of moisture in the hot summer. Between the two seasons there is a short spring, when the thawed soil is damp, and before the heat becomes too great; and in these few weeks—or almost few days—a perfect "forest" of grass covers the best watered areas, growing sometimes four or five feet in height. In less favoured areas the crop is far less in every way. It is important, therefore, to differentiate, and we may do so by speaking of rich steppe and poor steppe, the rich, naturally, in the damper northerly latitudes near the limit of the forest; or we may boldly borrow a word from similar good grassland in North America, and call the rich steppe "prairie," keeping the word "steppe" for the poorer land. This poor grassland passes equatorwards into scrub and desert, as the rich grassland passes poleward into parkland and forest.

The savannas are really due to the same two causes, but working in rather a different manner. There is always enough warmth for growth, and the wind is never cold; but Trade winds are normally dry, i.e. far from saturation, and the rain comes only in a very short season. The long dry season is a real "winter" for the plant, but the combination of heavy rain and great heat results in a flush of growth—for *short-lived* grasses.

The scenery in these steppes is monotonous only because of the immense distances and the uniform vegetation; in relief they show a good deal of variety of plateau and plain, highland and lowland.

Climatically, the extremes of temperature are associated naturally with low humidity, which means clear skies and bright sunshine; and, though the humidity is too low for heavy snow, the greatest danger to man and beast comes from dry snow driven by the *buran* wind. As the land is cultivated, evaporation increases and radiation decreases, and quantities of water accumulate in the subsoil. The unploughed sod is, naturally, covered with a thin carpet of frozen snow, which melts a little every day in early spring, but freezes again every night; but on ploughed land the melted snow gravitates down into the furrow, and is not left on the surface to be frozen again at night. The surface of tilled land, therefore, gets both dry and warm much faster than that of the untilled. As the land comes under cultivation, therefore, the climate definitely improves, e.g. in the amount and the distribution of rainfall and in the disappearance of summer frost. This is a fact of immense importance in the development of the prairie, especially in Canada.

Steppe Life. But the natural and primary product of grasslands must be grass-eating animals; and, though these may attract, as they do on the savannas, a large number of flesh-eating animals, the latter are incidental, and civilization sweeps them away. When man first appeared, e.g. on the "steppes" of Asia, no doubt he was a hunter—of these relatively defenceless grass-eating beasts; but he must very soon have realized the wisdom of saving any lambs or kids or calves which were following a sheep or goat or cow that he killed. And so practically all our most useful "domestic" animals, including horse and ass and camel, came to be domesticated. Indeed, the domestication and rearing of animals is the only occupation for which the steppes, as a whole, are naturally and entirely suited; and a large proportion will never, so far as we can judge at present, be suitable for any other purpose.

The natural effect of this on the scanty people of the steppes was to make them wholly and very efficiently pastoral. The vast area isolated them from any patches of settled agricultural country, and forced them to depend on their flocks and herds for practically everything—milk and meat, wool and skins. The milk could be drunk as milk, or fermented into koumis, or made into butter and cheese; the wool and the skins made clothes and carpets, tents, "bottles," and other utensils. The *best* products in each case came from the beasts which were most suited to the conditions, the horse meat and the mutton being far better than the beef, for really good beef is associated with lush meadow, not with the dry steppe grasses.

Of course, the life is one of constant movement, for the fodder in any one place is soon consumed, even if the wells do not run dry; and, in any case, there must be seasonal movement, e.g. to get shelter in winter or to escape from the swarms of insects on the lowlands in summer. A large number of attendants is necessary for the hundreds of animals, a great encouragement of large families, and a reason for even grown-up sons living with their father—which ends in an absolute patriarchal tyranny. The conservatism of the aged tyrants, the unavoidable ruin from storm and plague, the blood-tie through the whole group, tend to make them unprogressive, fatalistic, hospitable, etc. In a word, the geographic environment reacts on all sides of their life.

Artificial Grasses. Obviously, the proper business of grassland is to grow grass, but the grasses may be natural or artificial; in the former case the human life must be pastoral, and in the latter agricultural, at least in part. That is to say, the cultivated grasses may be grown as fodder for animals, e.g. lucerne and maize; but, more often, they are grown for "bread," e.g. wheat and oats. In other words, with the development of population throughout the world, and an increasing demand for "bread" beyond what the densely peopled areas themselves can produce, the great grasslands of the world have become our normal source of both bread and meat, even though the continental wheat and beef have not the flavour or the quality of our home-grown "island" products. A few of the continental areas, especially Canada and Hungary, raise wheat that is of good flavour as well as "strong"; but this is true only of a few. There is, therefore, reason behind the demand that a given proportion of our "soft," but good-flavoured, home-grown wheat should be used with all imported wheat in the grinding of flour for bread-making.

Two points are worth emphasizing, as typical of the proper help which economic geography can give in relation to such problems; and both may be illustrated from tropical Africa, a continent in which we have very wide imperial spheres of influence and responsibility.

The savannas are of immense size, and are for the most part more or less level; but they are all at a considerable height, some of them high enough for the climate to be suitable for Britons, even on the equator. Naturally, of course, the savannas provide pasture, and the great mass of the native inhabitants are essentially pastoral in occupation and organization, and in the course of centuries they have become very skilful—even if unscientific—cattlemen. They keep cattle, however, almost more as the measure of their own importance than as a source of food. And at present the best cattlemen, e.g. the Masai, are unwilling to sell their beasts, especially to the butcher, for the individual's importance is measured by the number of his beasts.

But maize is not only a native of tropical plateaus in South America—and so exceptionally well suited to tropical plateaus anywhere else, e.g. in Africa—it is one of the cheapest foods for fattening pigs and cattle, even though the quality of maize-fed "fat" is not very high. Further, maize is more or less indifferent to rough ground and to rough treatment, such as are typical of the Dark Continent; and the natives have grown it for ages, "mealies" being the typical staple food over a large part of the whole continent. There is every reason, then, why we should encourage the natives throughout all our sphere on the African savanna to grow more and more maize and to use it for fattening cattle and pigs. This would certainly result in a better quality of beef and bacon from the high plateau than is produced to-day on the low prairie of the U.S.A.; and even from the wetter coastal areas the bacon would be just as firm and good as the best American if a little coconut meal—easily obtainable from the coast-lands—were mixed with the other food given to the pigs.

CHAPTER VIII

ANIMAL PRODUCTS

THOUGH the total value of animal products in the world is not half that of the vegetable products, it is more than double that of the mineral products; and the number of "staple" animals is very much less than that of the staple plants. At the same time the relative importance of animal products is falling, not only for transport and draft purposes, but also for food. The main reason for this is the waste incurred in "preparing" animals for the market.

Meat—of all kinds, including game—comes next to cereals in this country for weight of food produced; but it is less important than dairy products because it is relatively dearer and actually less portable. We can, and do, produce two-thirds of our meat at home, contrasted with only one-fifth of our wheaten bread; but much of it comes from animals "finished" on cereals, which could have been largely used directly as human food. A given amount of "fodder," especially in the form of good grass and hay, provides—as milk—more food for man than is provided in any other comparable way; and, of course, the grass is not available directly as human food. But when food available for man is fed to beasts, there is appalling waste in the conversion of it into human food as meat, especially in the form of "fat" meat.

It is calculated that some 50,000 tons of fodder are needed to keep our home stock alive and healthy, but 70,000 to fatten them; and the average proportion of "fodder" to meat is about 40 tons of fodder, of various kinds, to one ton of meat. And of this "fodder" fully 30 tons is in the form of cereals or potatoes, etc., that could be used directly as human food. Indeed, Professor Wood estimates that 3,000,000 tons of maize, barley, wheat, oats, beans, peas, potatoes, etc., which might be used directly as human food, are fed to animals every year in this country.

All animals are not equally wasteful; but even the most economical "converter," the pig, does not produce one-tenth as much "meat" as it does consume of possible human food. The "roast beef of Old England" is the greatest extravagance, for an ox will consume thirteen times as much grain and potatoes as it will ultimately produce beef, and its total consumption is 64 tons of "fodder" for one ton of beef. This is partly due to the stupidity of what we may call fashion. There is more profit to the farmer on an ox sold after three months' fattening than after six months', and the meat is probably more wholesome, if not more palatable; but it is the fashion—a stupid one—to keep on fattening them for six months.

At the same time, we must distinguish between beef and dairy products. All things considered (milk, butter, cheese, veal), the milch cow is a more economical "converter" than even the pig. Both animals give about 1 lb. of human food for 12 lb. of "fodder"; but, while the cow is on a basis of grass, the pig—like poultry—in on a basis of grain, and the grain should be barley, i.e. one of the finer cereals. Poultry can develop perfectly well on maize, and—like the pig—consume a large amount of "offal"; but their total yield, in eggs and meat, is relatively less—1 to 14, instead of 1 to 12. Still, this is nearly twice as good a record as that of the sheep (1 to 24) for meat and wool, and nearly five times as good as that of the ox (1 to 64).

Animal Transport. The mere fact that motors are replacing animals for transport in Britain must not blind us to the immense historic importance of animals for draught and transport, an importance which still obtains very widely; indeed, but for animal transport and draught work, there could have been no large-scale agriculture on the great grasslands of the world, and motor traction is still far more expensive and less effective than horse traction on hilly and uneven ground. And, unless there is a speedy development of jungle for industrial alcohol, any considerable scarcity of mineral oil would cause a world-wide famine in the absence of farm animals for draft and transport. At present animal transport is *normal* over probably at least nine-tenths of the whole world; and outside a few relatively small areas, especially in North America and Britain, all farm work is done by animals, even in the most civilized areas. Of course, in this connection, the horse is overwhelmingly important in the more civilized continents and the ox in the more backward; and it is probably true to say that the horse is the most important medium of draught and transport in the world, (*a*) for farm work, (*b*) in rough country, especially when thinly peopled, (*c*) for drawing small loads short distances in densely peopled places.

Of course, both relief and climate have an influence in deciding the utility of the particular kind of beast. Sheep and goats, when living wild, escape from enemies by climbing; cattle and pigs escape by hiding in copse or brush; horses and camels escape by their speed. This implies that the sheep and goats are mountain fauna, that the cattle and pigs are typical forest fauna, and that the horses and camels are natives of wide plains. But, in their domestic state, all these animals have learnt to adapt themselves to somewhat unnatural conditions, though cattle still thrive best in England on land that was naturally forested, and sheep on the hills and mountains. Where sheep are kept in large numbers on plains, the climate and the soil must be such as guarantee a fairly dry surface.

But the adaptation to alien conditions seems to be never quite as potent as the natural state, and so the natural distribution is maintained in several ways, especially when the particular beast is one that tends to be pushed off the better lands. Thus, the sheep not only thrives best on the short, sweet grass that is typical of mountain slopes, but is one of the beasts which is relegated to poorer lands—such as on mountains. Even in Britain we have enough highland to have the largest number of sheep to the square mile in the whole world, though we have no land which is too dry for anything but sheep pasture.

This is, obviously, a problem in which climate as well as relief can be traced, and it is difficult to distinguish between the effects of the two; but, for all practical purposes, it is not necessary to do so. Climate may combine with relief to limit the amount of food, or its quality; it may weaken the stamina of the beast, or it may encourage dangerous pests, e.g. the tsetse fly. On the other hand, domesticated animals may live and work with impunity in apparently unsuitable places on imported food, as horses may above the snow-line or in the heart of a conifer forest. In each case the climate is quite healthy, but there is a natural absence of the proper and necessary food.

South America. A brief survey of the continents will be the best basis for one of the distribution of domestic animals, and we may begin with South America because it has the simplest structure. It is essentially a triangular mass, tapering to the south, and so having the greatest breadth where the heat is also naturally greatest—along the equator. It has three highland systems, one of them real mountains, and from these three highlands three great rivers flow which, in the course of ages, have laid down three vast plains made of the waste from the highlands.

Whence comes the water that feeds these great rivers? The moment that we look at a globe, we realize that South America is a comparatively small continent set in the middle of a huge ocean, and along the western edge of the continent runs the mountain system of the Andes—the longest and the least broken in the world. This great barrier lies directly athwart both the N.E. and the S.E. Trades, and also athwart the N.W. Anti-Trades, and forms one of the most effective precipitating media in the world, the precipitation inside the tropics being naturally on the eastern side of the barrier, but on the western outside of the tropics. Where the two Trades meet, in the east of Ecuador, "the *Equator* State," people who measure time by the moon say that "there is 13 months' rain in the year." But, of course, to leeward, i.e. to the west in the tropics, to the east outside the tropics, there is desert or semi-desert, and, in any case, the lowland in the west is very narrow.

The combination of great heat with great humidity throughout the whole year to the east of the tropical section of the Andes has covered an immense area with dense forest—wet jungle; and, however favourable such conditions may be to the growth of rubber, cacao, etc., they are most unfavourable to the grasses on which our domestic animals feed.

As you move north or south from the Selvas region of South America, you pass through parkland on to grassy plains, Llanos and Pampas, and the latter pass into real steppe farther south.

But these plains are all of them much younger, in a geological sense, than the great plains of Asia, on which our chief domestic animals evolved; and the most useful native animals of South America, the llama and the alpaca, were evolved, like the potato and the maize plant, up in the Andean "basins," i.e. the high mountain-girt plateaus between the various ranges, where the climate was most favourable, and where they had few enemies. Horses, cattle, and sheep were introduced by the White man, i.e. more or less recently; and, though the conditions are in many ways very favourable, the animals are essentially "foreigners," and have not become properly acclimatized. This is an advantage to breeders of pedigree stock, especially in the British Isles, as it means a constant demand for new blood.

The chief stock are cattle, numbering more than sheep and horses put together; and these cattle are bound to be mainly on the (largely tropical) grasslands—the pampas (Argentine and Uruguay), the llanos (Colombia and Venezuela), and the campos (Brazil). Argentina practically controls the beef market of the world. "Temperate" grasslands are found only to the south of the continent, where, too, the great meat trade has sprung up; and Argentina (including Patagonia) and Uruguay have nearly 80 per cent of the sheep of the whole continent. The horses are naturally associated with the historic cattle areas, the Argentine having over 50 per cent and Brazil well over 30 per cent, i.e. over 80 per cent in two countries. As a large part of these plains is very suitable for agriculture, especially the growing of wheat and maize, pigs—though at present unimportant—are likely to increase rapidly in numbers; and probably, a little later, there will be a similar rapid development of a poultry industry.

Success in every case depends on ease of transport; and in this connection it is worth noting that Uruguay, the nearest temperate country to Europe and possessing good river and sea communications, has far the largest number of animals per square mile and the largest number per capita; but, except for 7 per cent of the area, Uruguay is wholly pastoral, and 95 per cent of its exports are cattle and cattle products. Argentina comes second with the number per square mile and that per capita, but has also an exceedingly important agricultural industry; indeed, while agricultural products make up 65 per cent of her export values, pastoral products scarcely reach 35 per cent.

Africa. Africa is even more tropical than South America, so far as latitude is concerned. It lies directly across the equator, with the extreme north and the extreme south at about equal distances from the equator; and it includes both tropics, with their associated belts of high pressure. Its structure and relief combine also to intensify the tropical influence. For—apart from the Atlas—there are no real mountains in the whole vast continent, which forms practically one enormous plateau. The south-eastern half is higher than the north-western, and the upturned edge of the plateau *from below* may look like a mountain range; but even in the Drakensberg "Mountains," neither structure nor influence is montane.

We might guess this from the great proportion of desert in the country, but the high-pressure belts play a large part in the distribution of this. It is the general character of the plateau that is so unfavourable. Almost everywhere it rises in terraces from the coast only to break off with a flat "table" top, and then sink gradually inland. This not only spoils the rivers for continuous navigation, and specially for access to the ocean, but it condemns nearly all parts to a shortage of rainfall, for inflowing winds tend to be drained of moisture before they reach the interior. Of course, there is a wedge of constant rain along the equator, widening westward and including part of the Guinea coast; and the vast expanse of the Sahara, completely shut in by the land-mass of Eurasia, heats up so fiercely in the summer that a S.W. monsoon blows inwards across the Guinea coast. But the mass of the continent remains deficient in rainfall. It is true that most of the continent south of the equator has fully 20 inches of rain in the six months from November to April, and some parts have over 40 inches; but what is the value of even 40 inches if the average temperature is above 80° F., and if both evaporation and percolation are very rapid? The definite results are that as much of Africa is uninhabitable from lack of rain as of South America from excess of rain, and that the typical vegetation of the continent is grassland—tropical grassland.

What effect will this have on the distribution of animals? Much of the area would form admirable pasture for horses, but in this "Dark Continent"—the essential home of the slave trade—human labour was abundant and very cheap, and there has never been any real demand for horses or for mules and asses. The tropical latitudes are more favourable to cattle than to sheep and goats, but the latter are the more suited to the deficient rainfall. We may expect then that there will be a considerable number of cattle on the best-watered parts of the tropical "savanna" and of sheep and goats on the temperate veldt, and the actual returns for the various areas confirm this. Nearly half the horses in the continent are associated with the European colonization of the Union of South Africa;

more than half the cattle are found on the high eastern plateau, and are owned by natives; and more than half the sheep are in the Union of South Africa. Indeed, the Union contains about twice as many animals as British East Africa, and the latter has about twice as many as any other political unit, e.g. Algeria or Morocco.

Northern Continents. Asia, though in many respects a "primitive" area, like Africa and South America, combines many of the physical characteristics of both —on an enormous scale. It is, of course, far the largest continent in the world, and in all its phenomena one must always be guarding against the "control" exercised by sheer size. It has also the greatest average height and the greatest extreme height; it has as much plateau as Africa and far vaster mountain systems than South America.

The chief characteristic of the continent is the extent and the height of plateau, and the shape and the position of this divide the whole into four vast areas—two of highland and two of lowland, with the Pamir (37° N., 73° E.) as the pivot. The edges of the highlands, especially to the south, are marked by the greatest mountains in the world, the Himalayas and their associated ranges in the Hindu Kush, Kun-lun, and Tian Shan. These buttressed plateaus fill up all the mass of the continent between the Aegean and Behring Strait, and the whole of the area north-west of this nucleus is a continuous vast plain, crossed by some of the greatest rivers in the world, e.g. the Ob and the Yenisei. Mere size prevents the core of the continent from getting much rain; the height of the mountains prevents much of it from getting any rain; and almost nowhere is there a sufficient and *well-distributed* rainfall. But the size and other physical characteristics lead to an immense area of very high pressure in winter, when winds blow outward in all directions, and one of very low pressure in summer, when winds blow inward from all directions. There are, then, immense areas with very dry climate and others with heavy monsoon rains in summer. The latter are naturally unfavourable to pastoral industries, while the former are fit for very little else. But the conditions are not quite normal, for the mass of the population is concentrated in the monsoon areas, and the need for draft beasts, especially in India, is decisive; indeed, India alone has nearly 200,000,000 cattle, and even China has well over 20,000,000. The whole of Russian Asia, on the contrary, probably has not 10,000,000.

Europe. Europe and North America cannot be compared with the other three continents, for in them the artificial conditions—already noticed in India—have become the normal conditions. Both continents, of course, have temperate climates, and the structure and relief of both are favourable to other than pastoral developments. It may seem difficult, however, to believe that in the case of horses, cattle, sheep, and pigs alike, North America is behind—in some respects far behind—Europe. The latter has nearly four times as many sheep, half again as many horses, 17 or 18 per cent more cattle, and even 8 or 9 per cent more pigs. To some extent, too, the distributions show a geographical control; thus, 70 per cent of the horses are on the Great European Plain—in Russia, Poland, Germany, and France, and 50 per cent of the cattle are on the same area—in Russia, Germany, France, and Poland. Over 75 per cent of the pigs are associated with the grain-growing areas (especially barley and maize), e.g. in Germany and Czechoslovakia, a large proportion of the rest being associated with easy import of feeding stuffs, e.g. in Denmark. Sheep are still largely associated with poor, high land, and with backward areas, e.g. in Russia and Spain, Rumania and Italy; but other factors are also at work in Britain, far more important than any other country (though Russia has actually more sheep), and France, with nearly half as many as Britain. The Italian sheep are concentrated *not* on the Alps, but on the Apennines, for the real *alp* is too good pasture to be "wasted" on sheep.

North America. The story of North America is rather different, but purely geographical factors are still obvious, even behind clearly economic ones. Horses are most numerous in the grain-growing areas, e.g. Saskatchewan and Iowa or Illinois, and relatively more important in Canada than in the U.S.A. Cattle, in any numbers, are confined to the same two countries, but the U.S.A. has some 60,000,000 more than Canada, and Canada has five times as many as Mexico. The same is true of pigs, though Canada has more than twice as many cattle as she has pigs, while in the U.S.A. the number of cattle (58,000,000) is not much above that of pigs (53,000,000). It is entirely a matter of fattening on maize, Iowa alone feeding nearly 11,000,000 pigs, while Illinois feeds over 4,700,000, Missouri 4,000,000, and Indiana nearly 3,000,000. Other grain states are also important, e.g. Minnesota (3,300,000), South Dakota (2,400,000), Nebraska (2,200,000), and Ohio (2,100,000). Sheep are very closely associated with the Cordilleran States, Wyoming and Montana, New Mexico and Utah, though its size makes Texas seem important as having both the most sheep (4,600,000) and the most beef cattle (4,500,000).

PART IV
AGRICULTURAL GRASSLANDS

CHAPTER IX

DEVELOPMENT OF AGRICULTURE

THESE grasslands are of immense importance, for they are the basis of agricultural as well as pastoral activities, and are to-day the great scene of both. Though the relation is not always obvious, and though it has not matured historically in some regions and among some types of man, e.g. amongst the Red Men on the North American prairies, it is really very close; for our great bread-plants are merely cultivated grasses, needing as grasses exactly the same conditions as other typical grasses, while needing as grains conditions that are somewhat unfavourable to typical grasses.

Rise of Agriculture. Agriculture proper may have begun, not as a transition from pastoral conditions, but as a new and intensive occupation dependent—in Egypt—on irrigation. For Upper Egypt is a land of perennial drought, in which no plants can grow naturally; and so it could never have had any herbivorous animals except such as made seasonal visits, and these visits must have been dependent on the *régime* of the Nile. This has always given a flood-soaked land at the beginning of the cool season, when there is less evaporation, but sufficient warmth for hardy grains. Barley grew wild on this flood-plain long before man was there—trodden in by pigs that fled northward from the forests during the times of heavy rain. In the drought there was, naturally, neither weevil nor mildew, neither beast nor bird; and so the ripe grains survived where they dropped, until the flood water made them germinate. When man appeared on the scene, he soon learnt not only to use it (which accounts for the dreadful mortality among children from gastro-enteritis, proved by their mummified remains) but also to grow it, "dibbling" in the seed in imitation of the holes left by the pigs.

Certainly, barley and wheat do not show the protective features which we expect to be present in plants evolved in a normal struggle for existence; e.g. when grown in summer-rain areas, they are very sensitive to frost and to rust. Certainly, too, there was extraordinary progress in Egypt between 4000 and 3000 B.C., when nearly all the arts and crafts came into use, and there was a great increase in population, which had been more or less stationary for many thousands of years. There are some reasons, therefore, for believing that man began agriculture as an intensive irrigator in an area of drought; and he knew of barley early enough for it to have *the same name* in all Aryan languages. Then, much later, in Delos, with its summer drought, where there were no herbivorous fauna, only fish-eating gulls and flesh-eating owls (who would discourage mice and small birds), barley-eating man found wild wheat, and cultivated it as he cultivated his barley—first in Egypt and then in Babylonia.

Obviously, this is a possible, and even a plausible, explanation of the rise of a real science of agriculture in Egypt. It does not necessarily imply that elsewhere a habit of what may be called agriculture, did not evolve in a different way, e.g. on the margin of tropical jungle from women planting slips of banana, etc. But if the growing of wheat and barley had evolved in this casual and naturalistic way, these grains should have had more protective qualities than they actually have; and the lack of these qualities is very significant. In any case, there is a geographical control behind the process.

The Problems of Agriculture To-day. Even in the most advanced modern communities, we can still trace such a control, but it is masked by its economic accompaniments, as it has always been in periods of transition, i.e. of progress towards more industrialized methods of farming. For instance, open-field practice was quite a satisfactory method of satisfying one's own needs; but, as soon as one wanted to produce a surplus for exchange, it became unsatisfactory. Enclosure, therefore, became both normal and right. Thus, in Tudor times, we wanted to export wool; but we could not keep sheep on a large scale under the open-field system, and so holdings were consolidated and enclosed. Of course, if the enclosed land had been arable, it had to be laid down under grass, which—incidentally—meant the need for less labour; and so the practice, though in itself right, led to much unemployment and to great scarcity of bread. Much of the Tudor social legislation aimed at checking—for military reasons—what was, in its effects, a retrogade step.

The same conditions arose—from quite different causes—in Hanoverian times. For farmers had to try to meet overwhelming demands for food from a rapidly increasing industrial population, who knew nothing, and cared nothing, about farming. There happened to be some important new crops, e.g. turnips, and new methods of farming, e.g. different rotations; but neither the one nor the other could be applied on open fields. Enclosure, therefore, became an urgent need; and what had been opposed as retrograde under the Tudors, was encouraged as progressive under the Hanoverians.

In our own time the significant changes have been brought about, not by the deliberate policy of progressive farmers, but by the compulsion of bad times —due mainly to the development of the New World under all kinds of labour-saving devices for farming and for transport. Lands ploughed up in the Napoleonic days had reverted to grass, but progress directed development towards the dairy farm. The Great War sent much of this pasture back again into ploughland, even when such conversion was really an act of crass stupidity. The sequel is now before us. Good profits were often made during the War, but since then fully 25 per cent of the arable lands have changed owners, and are now being worked at a dead loss.

Labour. As a matter of fact, agriculture is very interesting, and needs really skilled labour ; but the economic status of the labourer is practically ignored in a country in which the great mass of our voters are *urban*. Under such circumstances labour is being lured away from agriculture—not so much to town-life as to a better economic status. This has, no doubt, raised the quality of the work done on allotments and small holdings generally, but it can only have the same bad influence on large-scale farming as comparable crises have had in previous ages. But, behind the necessary changes, we shall again find the geographical control.

If labour is scanty owing to the low economic status given to it, then it must be supplemented by machinery and used to the greatest advantage. This really means that we must develop large-scale production on light land, which can be economically worked with machinery, and devote heavy land to stock. The agricultural mechanic, like the real herdsman, must be rated as skilled labour, with a correspondingly high economic status; and both needs a large unit to give full-time employment to the definite unit of machinery and a "skilled" wage to the fully employed herdsman.

Climate. The problem includes climatic considerations. It is useless to grow wheat simply where there is light land easily worked by machinery, if seasonal rainfall and temperature are quite unsuited to that crop; it is foolish, if not useless, to keep dairy cattle in a sheep country, or sheep—for mutton—in a cattle country. In other words, we need a re-classification of our farm lands, associated with a climatic survey, and probably involving a new system of rotation of crops or an entire absence of such rotation. The regions of most suitable soil and relief for wheat-growing that have also the most suitable climate, will have to grow wheat always, with proper precautions against the exhaustion of the plant-food. In other words, we need a thorough application of economic geography to our agricultural problems. It is just one more case of the importance which ought to be attached to scientific geography, and it justifies our paying special attention to a geographical classification of agricultural regions.

Two things remain to be done before attempting such a classification for the two most important continents. One is to make it quite clear that our own British farmer is head and shoulders above the rest of the world simply as a farmer. The gibes hurled at him from time to time by politicians and publicists are merely "the empty laugh that marks the vacant brain." The British farmer contributes relatively *far more than his share of the world output*, even of wheat, though our total area of normal wheatland is very small; but he farms by the acre, not by the square mile. It is irrelevant to blame him because the Belgian or Danish farmer raises more wheat to the square yard. Indeed, it is as unreasonable to make a comparison about yield between the British farmer working to the acre with a plough over a total area of nearly 2,000,000 acres and the Danish farmer working to the square chain with a spade over a total area of not much above 130,000 acres, as it is to make one between the total yield obtained by the British farmer on his acre and by the Canadian on his square mile. And, as a matter of fact, there are *more* acres in England actually yielding from 40 to 50 bushels than there are in Denmark or Belgium!

Then what is amiss? Organization! Acre for acre, he is the best farmer in the world, but he is a poor marketer; and, even so, he tries to do two things at a time—to farm and to market. What the Danish farmer is really praised for, is doing one thing, farming, and leaving the other thing, marketing, to be done by an expert business agent. No farmer can do both in these days, not even if he does not attend more than one market a week. Even without any of the strong financial backing enjoyed by his rivals elsewhere, the British farmer could stand in a secure position if only he were relieved of the business side of his work and able to concentrate on his real work. What a farmer ought to be doing is farming, not finding markets.

The other necessary preliminary is to refer to what was said above as to light and heavy land, so as to make clear exactly what are the factors that are most important geographically. As a matter of fact, in most agricultural products not 1 per cent of the total dry weight is derived from the soil. All the carbon, nitrogen, etc., are derived from air or water, i.e. from factors concerned with the climate rather than the soil. But the latter contains a variety of elements which—often in tiny proportions—plants need, and the water and nearly all the food come to the plants through the soil.

CHAPTER X

SOIL

THE value of the soil depends, of course, on its chemical composition and its physical texture, i.e. the presence and the proportions of plant foods and the ease with which the soil can be penetrated by plant root or ploughshare. And the two are closely connected, so that it is really quite feasible to make the redistribution of our farm lands as suggested above. The structure, the aeration, the circulation of water, etc.—and so the food brought by air and water—are ultimately all equally dependent on proper cultivation; and "proper" does not necessarily mean "deep," for that depends on the climate. For instance, in a climate like that of Egypt, shallow ploughing does more good than deep.

At the same time, of course, there is one vital thing which is at present outside our control, and that is climate; and a proper geographical survey should result in immense improvement in our whole field of agriculture, if only by emphasizing the suitability of the different "climates" for different crops, and so suggesting the kind of treatment required by the particular soil in the particular area for the particular crop. But the cultivation will be done by machinery, and the soil most suitable for machine culture must be the soil cultivated; and rotation may more or less disappear, or, at least, be entirely reorganized. Deep tillage and proper fertilizers can always replace what a crop has taken out of the soil. On the contrary, grassland, however heavy, must be kept closely cut or closely grazed, otherwise the grass will not have any high proportion of proteins.

Indeed, cutting is so valuable that pulped grass from "lawn" cuttings may almost displace even barley meal for pigs.

From this point of view, even one-crop agriculture need never be fatal to the soil or the people, though it has been in the past, e.g. at the time of the Irish potato famine; but, of course, it involves serious dependence on climate, and involves the insect and other risks associated with climate. And it is obviously desirable for the farmer to have at least a second, if not a third, staple, if only to guard against complete crop failure; and, eventually, the work must be intensive, not extensive. What one can get out of the ground depends on what one puts into it.

Mediterranean Europe. Agriculture is not well suited to the summer drought and the rough topography of this region. Wheat is really important in two areas, Northern Italy and Old Castile; but neither has typically Mediterranean conditions, though over 30 per cent of all the cultivated land in Italy is under wheat. But there is an immense amount of market-garden and "truck" culture, especially in Italy and Spain; and, of course, the vine is found almost everywhere and the olive wherever the climate is really "Mediterranean," while the orange and the lemon are very important in south-eastern Spain and south-western Italy. Much of the wine and the oil is produced for home use, and Spain is a larger exporter of both than Italy; and the climate is very favourable to the drying of fruit, especially raisins and currants. Wine is the largest single export from Spain, and fruits come next; Italy produces twice as much oil as Greece, and Spain nearly twice as much as Italy.

East Central Europe. In all this Mediterranean basin pasture and pastoral products are relatively rare, and luscious fruits are abundant; and the scarcity of milk and the superfluity of fruit have always been adverse to child life, and the infant mortality here has been dreadfully high, however "comfortable" the conditions may have been to adults. North of the Alps there has been abundance of milk and more wholesome fruits, and, though adults have found life harder, children have found it easier.

Between the Mediterranean peninsulas, with their typical summer drought, and the continental plains of Russia, with their typical summer rain, there lies a transition area of rather intricate relief and very marked political subdivision, which has been the historic scene of constant clash between German, Slav, and Turkish influences. The core of it is the Hungarian plain, ringed round with mountain barriers, twice cut across by the great river—duplicated by the Orient Express railway route—that links together the whole, diverse, intricate region. The mountain retreats have favoured racial survivals, and the mountain barriers have impeded the mingling of peoples, while the constant warfare has been very adverse to agriculture and to any industrial development. In the north-west, German influence, local coal, and North Sea drainage have encouraged the industrialization of Austria and Czechoslovakia; and agriculture was greatly favoured until the rich "Hungarian" plain came under the political control of the illiterate Russians, Slovaks, and Yugo-slavs.

Czechoslovakia. Most of Czechoslovakia is an upland (1,000 ft. to 3,000 ft.), dissected by fertile river valleys; and the Czech part of the population is capable, intelligent, and very well educated. They have studied Western methods, and now fully 40 per cent of the whole country is under tillage. Methods are less intensive than, for example, in Belgium, but far ahead of those adopted by all the other States in this region except Hungary, and production is well balanced. Thus, the four hardy grains are raised in about equal quantities, though rye is slightly the most important (1,780,000 tons), and usually suffice for the minimum needs of the people. Potatoes and beets are very important, and are associated with the raising of cattle and pigs, so that the country is self-sufficient also in meat and milk. With abundance of good and cheap labour the country is now one of the most important exporters of sugar in the world.

Hungary. All the same, Czechoslovakia cannot compete with Hungary simply as an agricultural area, though the Hungarian export has been greatly curtailed by the loss—to inferior farmers—of large areas of the fertile Alföld. This is one of the great natural "granaries" of Europe, and nearly all the non-arable part of it makes excellent pasture. It is far enough south to have a really warm summer, and yet far enough north to have a really rainy summer, so that it can grow maize; and before the War no other European country raised so much maize, only Russia and France produced more wheat, and only Russia produced more tobacco. It was not only a question of quantity; quality, especially of the wheat, was equally prominent. Indeed, probably no other equal area in the world can compete with Hungary in the quality of her wheat except Alberta-Saskatchewan; and, as the climate is equally favourable to milling, it is not surprising that Budapest became the greatest milling centre in Europe, and Hungarian flour got the reputation of being the best in the world.

"Quality" of Wheat. So much nonsense has been spoken and written in recent times about the quality of wheat, especially with regard to our home product, that it is worth while to ask: "What is quality in wheat?" and "On what does it depend?"

Quality is two things—strength and flavour. They are quite distinct and not often found together, but it is not true that "all strong wheats are either harsh or insipid," nor that "all good-flavoured wheats are weak." The real interests of the farmer and the bread-eater in this respect are practically identical, but the supposed interests of the miller and the baker are rather antagonistic to those of the farmer and the consumer. It is another instance of antagonism between the appeal to the eye and the appeal to the taste. The consumer wants a good-flavoured loaf, the baker wants a big loaf or one that *looks* big; and so the one really should use weak wheat, and the other strong wheat.

From the baker's point of view the first great merit of strong wheat is that it can absorb an immense amount of water, so that the dough swells out to an unreal and misleading bulk; but the excess is water, not wheat. The second great merit is that strong wheat can stand rough treatment, e.g. foreshortened fermentation and hurried machine-working. No doubt, a larger loaf is probably light; and—except for "tin" or "pan" bread, where the tin itself "supports" the dough—strong flour is almost an essential for a large, light loaf, though *not* for biscuits or pastry nor for any other purpose to anyone who can really bake! French bakers use weak wheat!

But what is strength? It is really the percentage of gluten in the grain. This is a Mendelian characteristic which is transmitted unchanged, but it is very variable in amount, and the variation is closely associated with climate. Even congenitally strong wheats lose strength in a mild season, still more in a mild climate. In some years, e.g. 1904, a Canadian "Red Fife" has been weaker than a "Yeoman" in East Anglia; and in Central Canada, though the strongest wheat comes from Alberta, the Manitoban wheat is getting stronger as the moisture content of the soil is being reduced.

Strength, then, is percentage of gluten; and this is a climatic "response"—a "response" to the climate throughout the year, i.e. to the winter "control" of the soil and to the summer "control" of the plant. The winter control of the soil is very important in lands of low precipitation; but, obviously, if the thaw is to be very effective, so also must the frost be. In other words, the frost must come before the ground is covered with snow, which is a natural protection against the penetration of frost; and the summer must be first warm and wet to encourage growth, and then hot and dry to make perfect ripening. Incidentally, too, if there are "good" rains in the early summer, farmers extend the acreage.

Rumania. In Rumania maize ranks above wheat, the country being actually the largest producer in Europe; but maize is not normally an export crop, and the export even of wheat is likely to decrease. For 80 per cent of the people are engaged in agriculture, and—especially on the rich new lands acquired from Russia and Hungary—the old large estates have been broken up into small holdings. This is as wise politically as it is unwise economically. Men who own the land which they cultivate, are likely to be contented and conservative; but they are also likely to grow what they want themselves, and are certain not to be able to afford machinery, etc. Political stability must be set against cash crops for export.

Yugoslavia. In Yugoslavia not more than 25 per cent of the land can be cultivated, and much of it is so rough that it suits maize better than wheat or barley; and the people are largely illiterate, farming very small plots on very crude lines. The whole area is more suited to pasture than to agriculture—except so far as the large area of natural forest suggests that orchards should flourish. One of the chief exports is plums, and the oak and beech forests feed large herds of swine.

Though it scarcely applies to Yugoslavia, the presence of forests—as of minerals—in an agricultural country may help it to face some of the rapid changes with regard to the use of raw materials. Thus, hemp and flax, which are well suited to the eastern part of the Great European Plain, are being replaced as ropes and linen by steel-wire and wood-silk.

CHAPTER XI

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RELIEF AND AGRICULTURE

We have noticed continually that we may roughly classify the relief phenomena of the earth as mountain, plateau, and plain, and its "cover" as forest, grassland, and desert; and economic divisions of agriculture, pasture, and orchard may be, and actually are in some parts of the world, associated with all the three types of relief.

At the same time, it is obvious that agriculture on a large scale is much more suited to plains than to plateaus or mountains, because of the probable character of the soil, the actual facilities for cultivation and transport, and the normal distribution of population. And it is worth while analysing shortly the relation of the three types of relief to man generally as a prelude to analysis of their relations to man as an agriculturist.

Mountains. Unfortunately, for reasons which we must not consider here, mountains are commonly distributed round the margins rather than in the interiors of the continents; and, therefore, they have a close climatic as well as a structural relation to the ocean basins. This does not matter in a small and highly articulated area such as Europe, but is very adverse to the interiors of large areas, such as Africa, or of small areas which are not articulated, such as Australia. At the same time, that marginal position guarantees an extra supply of rain, which is favourable to the breaking down of the soil and the carrying of the soil down to form fertile valleys and plains, wherever it is not wasted immediately in the ocean.

In any case, mountain systems tend to be difficult of access, and the conditions of life are so hard that they are unattractive except to refugees from some type of tyranny elsewhere, e.g. the Basques and the Welsh. The parts easiest of access are also those of most use to man, the valley-floors, which tend to be much more fertile, and are much more sheltered, than the surrounding heights; indeed, agriculture is very difficult in such areas except on these valley-floors. Elsewhere the slopes are very steep, the soil is very thin, and the climate is adverse to the raising of crops (in some cases even to the growth of the hardiest trees), even though young or ripening crops may be more exposed to damage from frost at the foot than on the top of a hill. Only about 15 per cent of Japan or of Switzerland can be easily cultivated.

Under such conditions supplies of "bread" must be exceedingly limited, and that means either a very scanty and stationary population or constant emigration as a normal necessity. It means also, however, that every conceivable effort must be made to extract a maximum of food from the thin, stubborn soil in the bleak climate; and so every acre of useful soil comes to be used to its maximum value. In other words, intensive agriculture is a natural product of such conditions, and it includes all kinds of devices for preventing the precious soil from being washed away and for maintaining its fertility. The former means a very scientific "terrace" culture, and the latter means that the "gardener" must keep as many domestic animals as possible.

This "terrace" culture is very widely distributed, especially in the great monsoon lands of Asia, where it is carried to wonderful perfection in Japan, e.g. for tea-growing; and it is found *in essence* much more widely, for its essential principle is illustrated by the normal custom of growing fruit, e.g. the vine, on the south slopes of hills in France and Italy. It has also an incidental advantage in the fact that the different levels have perceptible differences of climate, so that it is feasible to grow successive crops of the same plant or simultaneous crops of plants that are respectively more or less delicate. In any normal Alpine valley such levels may mean fruit, grain, and pasture, with a belt of forest above that yielding fuel, etc., and another belt of "alp" pasture above the tree-line. At considerable heights, too, some plants arrive at a perfection unknown at lower levels; for instance, the real alp, between the tree-line and the snow-line, is far too valuable to be "wasted" on sheep.

This is, of course, one reason for the importance of stock-raising in mountain areas, and animals can get abundant food often where the slopes are far too steep, and where the ground is far too rocky, for tillage. Under these circumstances, too, there is little probability of any gross over-grazing, such as occurred on the public domain of the United States in the Cordilleran States.

Mountains have, however, another very important, but indirect, relation to agriculture—as forest reserves, especially in France; and China is a sad example of the results of ignoring this vital influence on the distribution of rain and all that such distribution implies. Large areas in northern or north-eastern China have been practically ruined by the wholesale felling of the forests which once covered them. In Japan, on the contrary, though there is such a crying need for more arable land, nearly three-fifths of the country is kept scientifically covered with forest.

Plateaus. The conditions of plateau life are widely different from those of mountain areas, unless there has been such heavy erosion and dissection that the area looks, and actually is, hill-land rather than table-land. Even then streams form cañons rather than valleys, and the relief is very marked.

We need not concern ourselves about the various types of plateaus or their origin, but may be content to think of typical plateaus as more or less high and flat. Most plateaus, however, especially in the Old World, have a distinctly upturned edge even when not actually fringed or buttressed by mountains; and this marginal height condemns them naturally to scantiness of rainfall inside the basins, i.e. over most of the surface. The dryness also implies great range of temperature. The typical vegetation is confined, therefore, to grasses; agriculture is found, as a rule, only at the base of the marginal heights, where soil and water supply are likely to be most favourable; and the population, apart from mineral deposits, is almost always scanty.

Some few plateaus, however, have exceedingly fertile soil, e.g. that of the Columbia in U.S.A. and the north-west of the Dekkan in India. Here great flows of lava have either filled up a huge valley or basin, or been spread over a "floor" of old, hard, barren rock. At once, of course, the conditions are altered, and important agricultural industries may spring up, as the wheat-growing of Oregon and Washington and the cotton-growing on the Dekkan trap. Generally speaking, however, plateaus are of less value agriculturally than mountain areas, and the latter are of less value than plains.

Plains. In the case of plains, again, we need not concern ourselves with the different kinds of plains or their origin; roughly, they are land that is low and flat. Obviously, it is wiser to cultivate a flood plain than a drift plain, stoneless alluvium rather than glacial debris; but the stubborn debris will "last" longer than the alluvium, and will get steadily richer with cultivation.

Most of the great plains of the world, whether useful or not, are in the Northern Hemisphere; and the most extensive plains in the Southern Hemisphere—mainly in South America—are, unfortunately, in very low latitudes, where the climate has been, and still is, very adverse to human progress. And so it becomes more important than ever to pay close attention to the climatic conditions of our areas.

Whatever the origin of the particular plains, then, the mass of the great plains of the world are in the Northern Hemisphere, i.e. the great land hemisphere; and, as land is the disturbing element in the distribution of climatic phenomena, the value of any plain must be very largely dependent on climate. For instance, the vast "Tundra" plains of Eurasia are of very little value, and the vast "Selva" plains of South America are in latitudes where the climate is very adverse not only to human progress, but even to human existence.

Given that plains have a climate favourable to human progress, their value is greater than that of any other areas of similar size in the same latitudes. The very name implies that the relief is gentle, and therefore transport is easy. The normal origin of a plain guarantees that its soil will probably be more or less thick and fertile, level and free from large stones, so that it is both easy to till and likely to give a large return on the labour expended.

This labour is naturally agricultural; all the great agricultural regions of the world are in areas that are relatively low and level; and, historically, these regions have been the scene and the source of man's steady advance in civilization. Where the food supply is great, population tends to be dense; where movement is easy, there is circulation of ideas as well as of people and products; and the meeting of peoples, with their ideas and their products, is a great stimulus to progress.

The one drawback to the environment of life on a plain is the physical monotony. In mountainous areas there tends to be a great variety of topography and climate within a small area, but on plains there is a similarity of topography and climate over a wide area; and variety is always the more stimulating to man. On the contrary, really high altitude means thin air, and that means a permanent handicap on human labour.

Population. If, then, low relief and low level give us advantages for food-supply, transport, and actual human effort in many latitudes, it is not surprising that the dense masses of the world's population are concentrated on the great plains; but it is interesting to note that the distribution is not uniform even over the whole area of what may be called a plain. It is almost impossible to be at all precise in such matters, but there is certainly a good deal of evidence that a very large percentage of the world's population is to be found between 500 ft. and 1,000 ft. above sea-level. Probably more live below 100 ft. than above 2,000 ft.; but very low and flat lands are obviously liable to be badly drained, and in low latitudes are very hot. For both reasons, then, they are apt to be very unhealthy, though they may be immensely productive, e.g. of rice and sugar.

The truth is that it is very difficult to treat of relief without and apart from the accompanying climate; the two must be taken together, size and height being related to temperature and rainfall. Small plains, of rather rough relief, and surrounded by natural barriers of mountains, were the scenes of great progress in early times, e.g. in Greece, but they were in intermediate latitudes, with mild, wet winters and dry, hot summers. And just because they were small, and because their water supply was strictly seasonal, every possible effort had to be made to get the full value out of them.

This is a very important point, to which we may come back, but, in passing, we may notice that geographical difficulties excite human effort and ingenuity. The wine of the Reims region owes much of its quality to the fact that Reims is *just within* the northern limit of viticulture for wine-making in France; and so the vineyards are localized, and special care and skill are developed in the culture. Thus, full use is made of the long summer days, the southern-eastern slopes, the right gradients (30°–45°); and the winter is hard enough to force the vines to take a proper *rest*.

CHAPTER XII

AGRICULTURAL REGIONS

THE most important of the great plains till quite recently, and specially in the earliest historic times, have been those with adequate rainfall in intermediate latitudes; and some of them are still amongst the most densely peopled areas of the world's surface. Obviously, in middle latitudes there should be "middle" conditions of life, e.g. absence of extreme temperatures and of great excess or great deficiency of rainfall. There are areas in these latitudes where the conditions are extreme, with extremes of heat or cold, of drought or humidity; but in those which are favoured by normal middle latitude conditions, life is relatively easy. The main wealth is in the soil, and the population is mainly agricultural; but abundance of food again means dense population, and that means cheap labour. And where the area has also wealth in forests or minerals, this labour may at once be used in forest or mineral industries.

The question of adequate rainfall suggests that such areas are relatively near the ocean, and this must favour commercial development. The actual commerce may not be carried on by the real plainsmen, but the wealth and the people of the plain are behind it. The Hindustan plain is of immense importance in the world, and some of its products are essentially vast crops raised mainly for export; but several causes combined to deter the Hindu from entering into sea commerce. Thus, the country is curiously deficient in good harbours, the coasts are subject to adverse currents and dangerous storms, and the season of inward navigation for wind-borne vessels coincided with that of maximum agricultural pressure. The total result was that the sea commerce of India came into the hands of foreigners.

Problems of Middle Latitudes. These great plains in middle latitudes suffer, however, from two drawbacks. One is the long time that they have been inhabited and cultivated, and the other is the rather enervating climate. For instance, in Northern China much of the soil is actually "tired," and needs a rest. This is partly because the intensive character of the culture does almost nothing to help the *soil*. Everything possible is done to help the plant; it is fed daily or weekly with so many spoonfuls of "fertilizer," and it consumes every drop. That is to say, the soil gets nothing, and is gradually becoming exhausted. This can already be seen by comparing the "old" delta of the Ganges in the United Provinces with the "new" delta in Bengal. And this gradual impoverishment of the soil, if not corrected, must slowly drive labour from rural into urban occupations.

The climatic pressure is really the more urgent. Proper farming can restore the fertility of the soil, but the quality of the labour can scarcely be improved in any similar way; we must not expect most economic progress where man can reap maximum result with minimum effort. This does not mean that these areas do not, and will not, seriously compete with plains in more bracing climates; but it does mean that, in itself, for example, Indian labour will be relatively less valuable than English labour.

Unfortunately, the plains with more bracing climates are mainly in the interior of Asia and North America, the steppes and prairies of the Northern Hemisphere; but here, as we have seen, the conditions are not favourable to dense population, i.e. cheap labour, and continental interiors are expensive and often difficult to reach. At the best these interior plains are not likely to be industrialized; but, especially where there is mineral wealth that may pay the cost of railway construction, this in its turn will greatly encourage irrigation agriculture or dry farming. Even so, probably alfalfa and wheat will be the most paying crops; in other words, stock-raising and bread-growing will be the dominant interests, because the dominant demands are for bread and butter, milk and meat.

Russia. The largest of these areas belongs to Russia, but it is exceedingly difficult to make any statement about the condition of Russia to-day, as it is impossible to trust any of the statistics issued. For instance, ever since any serious records have been kept, winter drought in Rumania has been accompanied by winter drought in South Russia; and now we have definite knowledge of a complete failure of snowfall in Rumania followed by an official Russian announcement of magnificent crops in Russia. If this were true, it would be a reversal of all known records, but no geographer believed for a moment that it was true.

Fully 77 per cent of the Russian people—compared with less than 7 per cent of the English—are engaged in agriculture, as peasant farmers or farm labourers; and even more than in Rumania recent events have led to a distribution of land favourable only to the supply of local wants. Even before the War only a quarter of European Russia was under cultivation, but that meant so large an area that Russia produced one-third of all the barley in the world. Yet barley was less important than wheat, and wheat was really less important than either rye or oats—the latter being in great demand because Russia had then one-third of the horses in the world. At the same time the country was producing more potatoes and sugar-beets than any other country in the world except Germany, and more flax and hemp fibres than all the rest of the world put together.

The peasants are always very poor and grossly illiterate, but before the War the large estates were well managed, and a good many landlords took care that the peasants had help and advice about the management of their own lands. Even so, the peasant lands did not produce even two-thirds of what was produced on the large estates, and there can be scarcely any doubt that their output per acre now is the lowest in the world; and, as they must be most and first concerned in providing the necessaries of life for themselves, the probabilities of any *natural* surplus for export are small.

Problems of Low Latitudes. When we get to the humid plains of low latitudes, e.g. the Selvas of the Amazon basins, conditions are completely changed. The climatic conditions include almost constant rainfall and almost uniform temperature throughout the year, and the rain is heavy, and the temperature is high.

These conditions are very favourable to vegetation, which is both varied and dense, but equally unfavourable to man. Of course, the high humidity and high temperature are very enervating, making continuous exertion, even for a few hours, extremely difficult and exhausting; and the abundance of plant life is overwhelming. The task of clearing land for agriculture is immense; and, even when it is cleared, the task of keeping it clear is unceasing. For instance, on the few railways that exist in such areas, practically every train must spray the line with "weed-killer"!

Nor is there, under such conditions, any obvious incentive to make the native inhabitants anxious to work. Pastoral and agricultural industries the whole world over seem to have been developed only where the natural food supply has been deficient. Here there is no such deficiency—from the natives' point of view. Such areas are always threaded with rivers, and these are rich in fish, which are easily caught in nets or baskets where the water has been "poisoned"; and the land between the rivers is covered with dense vegetation, including many palms, from some of which the various "poisons" are obtained for smearing arrows or sprinkling on water.

As food is relatively abundant, and there is little or no need for clothes or shelter, there is no obvious reason for working. In most of the areas women do plant shoots of banana and breadfruit, or even sow seeds; but they leave the plants to grow as they can, and sometimes do not return to the place at all.

Agriculture, then, as the essential basis of civilized life, cannot be associated with these humid plains in low latitudes; but such plains may have great value —e.g. for the production of raw materials, whether a definite product for a definite purpose, such as rubber, or a wholesale mass of varied products, such as may be used to produce industrial alcohol.

We must confine our attention, therefore, more or less to those plains on which climate is more favourable to man than to plant, and to which there is reasonable ease of access; and from one point of view the problem is a joint one. For ocean transport is far the cheapest medium of commerce, and the ocean is the source of all the supplies of rain that make agriculture possible.

Britain. But these plains are precisely the regions most attractive for many other purposes. Historically, the good supply of food meant a dense population; and the relief, except for the presence of marsh, meant easy intercourse. And at once the consequent cheapness of labour and of transport attracted other industries, naturally antagonistic to the presence and the prosperity of the cultivators. Some square miles of the most fertile land in the Thames basin have, in recent years, been covered with motor-works and workmen's houses, though there were much less fertile lands available in the immediate neighbourhood. Indeed, the actual assertion was made that workmen had as much right to the *best* land in the parish as anyone else. We may agree, and yet deny that anyone has a right to use fertile land for such a purpose when less fertile is as conveniently available.

It is partly this antagonism between urban and rural interests that has eventually made us more dependent on imported foods than any other country in the world; but this is quite a "recent" result, depending on the superior voting-power of the urban areas. A century ago we were "safely" agricultural; we fought Napoleon "on the basis of turnips," i.e. on our scientific agriculture. To-day nothing like 10 per cent of our population can be allotted to agriculture, and not much over 25 per cent of our total area is cultivated at all. Of course, there is a great deal of it in permanent pasture—15,500,000 acres out of a total of 25,500,000 in 1929: but, as we have seen, this is an uneconomic way of using land (cf. p. 45).

The fault does not lie with the average farmer. On the drier south-eastern quadrant of Britain very high yields are obtained of wheat and barley, and the average, even for the whole country, is over 35 bushels per acre; but the climate is so humid that a large proportion of the crop is apt to be discoloured and otherwise diminished in value. Such a climate is very favourable, of course, to many fruit and vegetable crops; and, in both cases, better organization would greatly increase our home supplies, and decrease the immense quantities imported (cf. p. 60).

France. France, of course, has many advantages over us from this purely agricultural standpoint, including a greater variety of climate; and she profits especially by having a wide area of fertile, well-watered lowland in her "Atlantic" drainage, with typical summer rains, and a considerable area of "summer-drought" lands in the Rhône valley. At least half of her total area is of more than usual fertility, and nearly 90 per cent of this is actually under cultivation, employing fully 40 per cent of her people; in fact, slightly over half the total population is *rural*. Most of the cultivators, too, *own* the land which they cultivate—an admirable feature politically, but resulting in relatively poor cultivation of relatively small areas; for the peasant owner cannot cope with more than about 30 acres, and that is too small an area to make the use of machinery economical, especially as the 30 acres are often not all in the same place or even in the same immediate neighbourhood. Indeed, the peasant farmers tend to live in villages rather than *on* their farms (cf. p. 67).

The standard of comfort is, however, high—measured by the use of white, i.e. *wheaten*, bread. This use of the word "white" is misleading to us, for we contrast "white" with "brown," both being wheaten and the brown being rather the more wholesome; but in continental Europe "white" means made of wheat, not rye. All France eats this "white" bread, and on every farm a fifth of the area is usually under wheat—much more than a fifth in the Paris basin. They do grow rye—on the poor soils and in the bleak climates of Brittany and the Central Massif, but it is less important than even oats, which are naturally confined to the cooler and wetter north.

The small holdings are favourable to special kinds of culture, especially viticulture. Centuries of cultivation have made the soil on many hill slopes exceedingly well suited to the vine, and the types of climate are equally well suited to the production of fine kinds of wine—light wines in the marine climate of the south-west, and strong wines in the more continental north-east. Of course, the French are essentially wine-drinkers—for the same reason that made the Chinese tea-drinkers, i.e. that centuries of cultivation (with manure) made the surface water so infected with bacteria that it could not be used for drinking purposes. The wine drunk locally, however, is of an inferior kind, often imported, e.g. from Algeria, and the quality of the best wines is due to the care and skill with which they are made as well as to the soil and climate. With regard to the latter a south-eastern exposure on a slope of 40° to 45° is very favourable, especially with regard to morning and autumn sunshine and to good drainage (cf. p. 75).

Life has been hardest, of course, in the rye districts; and these are precisely the areas in which the round-headed Alpine type of man found homes originally, and from which there has been most outflow of population to areas of easier life, especially in towns. This explains why the French textile industries drew such a large proportion of their labour from these very individualistic people, whose individualism has been closely and most profitably reflected in the quality of the textiles.

Labour has also been responsible for the—politically unfortunate—location of the French beet-sugar industry. Sugar beets require a great deal of hand labour, which must be cheap, and this was found on the north-eastern coalfield, where, too, it was easy to import still cheaper Belgian labour for seasonal work on the crop. The location, however, involved the complete collapse of the industry during the War.

The small holdings are also favourable to market-gardening, so long as there is proper co-operation for marketing. In western France it is largely in connection with the feeding of cattle (roots); in south-eastern France the dry, sunny summer favours the raising of flowers; in north-western France the mild climate and the nearness to the English market favours the raising of "early" vegetables.

Belgium and Holland. Belgium might be expected to reflect the conditions in north-eastern France, but it nearly always improves on the French. The coastal strip is very unfertile, even in the polders; but there is a very fertile belt across the middle of the country, and the standard of cultivation is much higher than in France. The population is so dense that labour is very cheap, and *must* be industrious, while the average holding cannot be large, the average being under three acres. On some 300,000 of these little holdings an immense amount of food is raised—wheat, oats, rye, barley, potatoes, and sugar-beets; but, as only about 60 per cent of the whole area is suitable for such culture, the country cannot entirely feed itself, especially as a considerable amount of land is devoted, especially in the Lys valley, to horticulture (often under glass) and to raising flax. The four non-cereal crops—potatoes, flax, beets, "bulbs"—are all such as require a great deal of cheap hand labour. More than a quarter of the cultivators own the land which they cultivate, but they are often also engaged in some kind of supplementary —e.g. factory-work.

Holland, like Belgium, raises an astonishing amount of food—with similar crops, except that buckwheat is more important; but the total amount of land really suitable for cultivation is scarcely one-third of the whole area, and a greater amount of attention is devoted to horticulture. Further, much of the best of the heavy land is devoted to dairy purposes.

Germany. Germany had naturally a large proportion of poor land, and experienced a typical movement from rural to urban industries; but her rich supplies of potash and other manures and scientific organization have more than made good the natural deficiencies. Their light, sandy soils and their cool summers make the northern farms very favourable to potatoes and rye, the two staple foods. Nearly one-seventh of all the cultivated land is under potatoes, 50 per cent of the crop being used as human food, 40 per cent fed to stock, and 10 per cent used for starch, "flour," and alcohol. Rye, though less important, occupies nearly three times as much land as wheat; and sugar-beet is the crop which profited most by the interest in chemical industries.

No other crops can compare with these in importance, though the vine and hops, and even tobacco, are very successfully grown, especially in the fertile and sheltered Rhine valley. About one-third of the population are engaged in agriculture—on about half the total area of the country, and the farms are much larger than in Belgium; but there is a large number of relatively small farms (the same size as in France), and many of them are owned by the farmers. But where potatoes and rye-bread are the staple foods, labour must be relatively cheap; and where a semi-continental climate guarantees a bracing winter, man ought to be hardy and vigorous. This is only an empiric statement in the meantime, but all the evidence so far is in support of it. Certainly the presence of constant cyclonic movements is very stimulating to both brain and body.

Other Baltic Areas. To the south and the north, especially in Norway, but very largely also in Switzerland and Sweden, agriculture is very precarious and heavily handicapped. Even in Sweden only 10 per cent of the area is under tillage, and the percentage of the population engaged in it is steadily falling, though it still approximates to 50 per cent. As the total population in all these countries is increasing, more and more competition develops for surplus breadstuffs elsewhere, especially in Canada and Argentina.

Only in Denmark is the position at present really satisfactory, and even there agriculture is definitely devoted to the raising of food for cattle and pigs; and Sweden is copying Denmark in this. Thus, Sweden has 200 cows for every 1,000 acres of tillage, and nearly 350 cows per 1,000 people; Denmark has very nearly 200 to the 1,000 acres of tillage and 400 per 1,000 people. And, of course, Denmark has facilities for importing oil-cake, maize, etc., quite denied to Switzerland and far above those of Sweden. The other Baltic States are no better off, though the Finns and the Letts are very capable and highly educated people, able and anxious to make the best of their opportunities; but much of the land is very poor, like the Laurentian shield in Canada, and the climate is adverse.

Poland. Poland is in rather a different and better position. It is naturally a typical piece of the Great European plain in the region of rye, potatoes, and sugar-beet; and the rye and potatoes have the same relative importance as in Germany, though the acreage under rye is more than twice that under potatoes (6,500,000 acres). But there is even more evidence of the Great Ice Age—in the shape of rough moraines and wide expanses of marsh; and the old Russian part of the country is very backward, while in all parts the landless have formed an enormous percentage of the population. Still there are large areas of very fertile land; the climate is favourable to agriculture—specially concerned with the four hardy cereals (rye being far the most important), potatoes, beets, and flax; and nearly half of the whole country is now actually under tillage, however inefficient.

Before we leave the agricultural base, and examine the industrial superstructure, we may again usefully remind ourselves of the fundamental and overwhelming importance of agriculture. It is ignorance of this importance, or indifference to it, or a combination of both, that is behind many of our most pressing economic problems to-day.

Of course, we live in times when we draw the mass of our bread and meat from lands that are thousands of miles away, and that most of us have never seen, and will never see. The importance of the source is, therefore, obscured, and the concentration of our population in cities gives the urban vote undue value; for a concentrated vote is the one force which instantly brings politicians to heel, and in the meantime that urban vote is very ignorant—geographically.

We must also remember that agriculture is itself an industry, far the most important of all industries, and that it was one of the first to be "industrialized"; and it has been industrialized relatively more than any other, especially in the more typically industrial countries.

PART V
INDUSTRIALIZATION

CHAPTER XIII

EUROPE (1)

BASED essentially, if not obviously, on the agriculture at which we have been glancing, there has developed our modern industrialism; but structure and location become now relatively more important than relief and climate, though all four are intimately linked together, structure often betraying itself in relief and location dominating climate. The important position of Europe and its complicated structure make it an appropriate area to which to devote first and most attention.

Britain. In the case of Britain, location has been of immense importance, especially if we press insularity as a factor in location. Ice-free islands in the busiest of all seas, on the direct track of cyclones, have advantages for health, work, defence, and commerce that are almost unequalled; and the nearness to Europe has been as valuable commercially as the separation from Europe has been politically.

The cool, moist climate has been very favourable to the production of nourishing grasses, especially for the production of milk and meat; and the combination of "wet" mountains in the west and "dry" downs in the east has supplied good mutton along with good wool. The wool is not "fine," but laid the foundation of our woollen industry, and home supplies still provide about 25 per cent of all the raw material used. Climate and relief also supplied abundance of pure water and of water-power in the earlier days.

When water-power in its earlier forms gave place to coal, we were still more favoured. Even now we produce more coal than all the rest of Europe put together, and more than any other country in the world except the United States; and we had very useful supplies of tin and iron, and even copper and lead, as well as some very fine stone and clay, our china clays being still necessary, e.g. for the U.S.A. potteries at Trenton and elsewhere.

These advantages, added to the type of people and to the stimulating "cyclonic" climate and the island location, gave us a lead in industrial development, which was at first very wide, but has now rather narrowed to a specialization in textiles, especially cottons. Here, again, our moist, equable climate has been exceedingly favourable to *fine* work, and our proportion of fine work is higher than anywhere else in the world.

The textile industries gave a great demand for iron and steel products, and the metal industries developed round the two great iron-fields of Birmingham and Sheffield, as the textiles had round the two great centres of Manchester and Leeds. Of course, most of the ore used is imported, and that led to the development of coastal industries, where—naturally, especially in view of our island location, our widely scattered empire, and our great dependence on export trade—we began to specialize in shipbuilding, particularly in and around Glasgow, Belfast, and Liverpool on the Atlantic coast, and on and around the mouths of Tyne, Wear, and Tees on the North Sea coast.

Our original advantages, however, have become relatively less useful, while our power to feed ourselves has diminished; and our imported food can be paid for only by our coal and the products of our labour, whether on land or in our mercantile marine. This lends special importance to all problems connected with coal and with shipping.

Our predominance in mercantile marine has led to about one-fifth of our exports being really re-exports, generally without any great change in the form of the imported products; and this "entrepôt" trade is exceedingly interesting, linking London back through hundreds of years with its predecessors in this—Amsterdam, Antwerp, Bruges, Lisbon, Genoa, and Venice. Of the real exports, manufactured goods represent fully 80 per cent of the total, coal being the only other staple; and if *all* iron and steel goods are grouped together, they have a larger aggregate value than all the cotton goods, woollens coming third. And the raw materials imported for use in their manufactures—e.g. cotton, petroleum, wool, wood—are nearly as important as the foodstuffs—e.g. grain (and flour), meat, dairy products, sugar. The War has weakened, however, the entrepôt control of London—e.g. in rubber, tin, wool, hides.

All the entrepôt cities mentioned above are in Europe, and London is essentially "European" in this respect; and for that reason its importance must vary with the importance of Europe. Liverpool is a real rival of London, especially for American trade, but London is still the entrepôt centre, although the mass of our imports comes from the New World. The mass of our exports, however, goes eastward, India having been hitherto our best customer; and, though half our imports come from the five great producers of foodstuffs and other raw materials (U.S.A., India, Canada, Australia, and Argentina), goods of great value come from our three little eastern neighbours—Denmark, Belgium, and Holland.

One thing should be made quite clear, about which there is much ignorance—and still more prejudice. For the actual delivery of goods from point to point our railways have the *lowest* charges in the world, but they are relatively expensive for the particular part of the process which is actually done *on the lines*, i.e. apart from collection, delivery, etc.; and the reason is the great original cost of the permanent way (see page 146). Again, this is largely due to *unavoidable* geographical difficulties. Nearly all the industrial areas in France, Germany, Belgium, and U.S.A. are flat or nearly flat; nearly all ours are very hilly, so that we have an abnormal number of tunnels and bridges, cuttings and embankments per 100 miles; and our country is so densely peopled that we have an abnormal number of stations per 100 miles. Further, all foreign railways have been built wholly or partly at public expense, and five out of every six are a very heavy charge on the public purse. (See Note on p. 101.)

France. France has a position slightly more favourable than our own; indeed, it is probably the most favoured in the world. With equal advantages of climate and access to the North Sea and the Baltic, it has nearly as good access to the "Great Circle" routes of the Atlantic and much better access to the Mediterranean and the Suez Canal. At the same time, its political frontier brings in problems which more than neutralize this latter advantage.

In one point now France stands first in Europe and far ahead of every other country in the world except the U.S.A., and that is in her supplies of iron, fully 40 per cent of the whole European reserves. One reason for the rapid industrial development of Germany in the generation after 1871 was the acquisition of the minette ores of Lorraine, and the loss of Lorraine has meant the loss of nearly 70 per cent of her iron ore; but even with the Saar coal France has not got, as Germany had, the necessary fuel for working the ore, and so she cannot make as much use of it as Germany did.

Indeed, the French coal is neither abundant nor of very good quality; and its distribution is rather unfortunate, for the chief field is on the north-eastern frontier. This, of course, with all its associated industries, was over-run, and held, and devastated, by Germany during the War; and the industries had to be moved elsewhere, and some substitute for the local coal had to be found. Thus, there was a double development: (1) of manufactures in other, and less exposed, parts of France, and (2) of "white coal," or water-power, from the Pyrenees, Alps, Auvergne heights, and even the Vosges. The amount of water-power used in France increased by more than 100 per cent between 1913 and 1921, and the distribution of the sources of power implies the increase of industries in the *less* fertile parts of the country, i.e. with less encroachment on agriculture (cf. p. 81).

Further, as the coalfields are both small and widely distributed, there was little to encourage large-scale production, and much to encourage individuality of work—also encouraged by the main source of labour (cf. p. 83).

Even the best of the coalfields were, and are, costly to work; and France is poorly supplied with minerals other than iron. The most important of her metals, aluminium (bauxite) and antimony, are relatively of subsidiary importance; and the only valuable deposits of other minerals are of china-clay, e.g. near Limoges, and potash, in Alsace.

The deficiency of coal and other obstacles to large-scale industry, the French temperament, and the regional sources of most of the industrial labour, combined to concentrate attention on quality rather than quantity, especially in textile work. Her silks and woollens, both unsurpassed in the world for design and finish, were based originally on her home supplies of silk* and wool; but cotton had always to be imported, and the cotton industry settled naturally round the great Atlantic port of Rouen, on the Lille coalfield, or at the foot of the Vosges, where the relative humidity was fairly high, and where water-power was abundant and accessible. All these are associated, directly or indirectly, with the waterways of the Paris basin and the system of railways that radiates from Paris. Relief and climate are very favourable to the use of waterways in France, where the internal navigation comprises 7,000 miles of rivers and canals; Paris itself is really the busiest *port* in France, and 50 per cent of its total trade is done by water; the trade is mostly "domestic," but the total is larger than that of any ocean port in France. Paris and Strasbourg together do more water trade than Havre and Marseilles together!

In its foreign trade France is favoured by its large home production of foodstuffs, so that its imports are largely raw materials; and while the French take the third or fourth place in the world as a trading people, the *per caput* value of their trade is the highest in the world. Again, the importance of neighbourhood is obvious, Britain and Belgium being her best customers, and Germany, Switzerland, and Italy, all being more important than any other country except the U.S.A.

Belgium. What has just been said about France may be pressed still more about little Belgium. A highly developed agriculture encourages a dense population at the focus of some of the most important ocean and land routes of the world, where the three greatest industrial and commercial countries of Europe—Britain, France, Germany—practically meet. The position has its obvious political dangers, but equally obvious commercial advantages; and an abundance of good coal has been as favourable as the dense population to the development of industries, based largely on the old wool and flax of historic "Flanders." In the time of William the Conqueror, Bruges was the chief wool market of the world; in the time of the Black Prince, Ghent was five or six times as large as London; in the time of Queen Elizabeth, Antwerp was the greatest port in the world. Indeed, as long as hand work was supreme, Flanders was supreme in textiles (especially wool); and she is still very important in these days of machine work, but all her raw materials—even wool—are now imported.

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* Of course, the silk industry is *much younger* than the woollen.

Wool, wheat (and flour), cotton, and iron (and steel) are her four first imports; and iron (and steel) goods, woollens, cottons, and glass are her four first exports. Of course, Lorraine and Luxemburg are very convenient sources of iron ore, and Luxemburg has now a definite politico-economic association with Belgium. The export trade has gone naturally to neighbours —17 per cent to Britain, over 13 per cent to Germany, 12 per cent to France, and over 10 per cent to Holland.

Holland. No one expects to find much mineral wealth in the deposits of mud which make a delta; and, though now the Limburg mines do produce over 10,000,000 tons of coal a year, in the past lack of coal has hampered industry as greatly as the large colonies have favoured commerce, especially in such typical tropical products as coffee, cacao, and sugar. Though three-fourths of the land can be used for agriculture and pasture, only a third is very productive; and the chief asset of the country has been its position where the navigable Rhine enters the unfrozen North Sea, i.e. a trifle too far north to be, as Belgium is, on the direct line of movement—in peace and war—between Paris and Berlin. Rotterdam has a big transit trade.

As the practical absence of both coal and water-power has impeded industry, the only natural development has been in connection with the one mineral product —clay; but two-thirds of the country is directly used for raising stock, on meadow and farm crops, and for the allied industries, e.g. the making of margarine, butter, and cheese.

Germany. Geographically, the assets of Germany have been—in their probable order of importance—(1) the central position in the continent which leads the world politically, industrially, commercially (even in agriculture Europe has been far ahead of all other continents, e.g. producing more than half of the whole world output of wheat); (2) the mineral wealth in coal, iron, and potash and other salts—the last enabling her to produce immense quantities of ammunition camouflaged as agricultural manures; (3) the size, direction, and distribution of her waterways; and (4) the invigorating climate. Incidentally, her strategical position and her physical character greatly favoured a typical political development, under which freedom was sacrificed, but organization was perfected; and amongst the results of this were scientific agriculture and scientific forestry, the draining of swamps, the fertilizing of sandy soils, the foresting of thin soils. At the same time, rivers were dredged and straightened, and linked by canals; waterways and railways were forced to co-operate; and the waterways were made free, while the railways were built so as to carry the heaviest ammunition trains.

The size and the distribution of the coalfields were a great asset, each of the main rivers having its group of fields, the Silesian field (now mainly Polish) being actually the largest, but the Ruhr field having the best coal (especially for coking) and the best position. Next to the wealth in coal came a monopoly (now broken by the loss of Alsace) of potash salts ; and the abundance of potash and common salt formed the basis of the vast chemical industry, equally valuable for agriculture, industry, and ammunition. Upper Silesia was also very rich in zinc and lead.

These, with easy access to the markets of Europe, were the bases of German industrial development ; and it was as natural for Germany, with its coal and salt and potash, to specialize in chemical industries as for Britain to specialize in textile industries. Of course, Germany also developed a great iron and steel industry, e.g. at Essen, and a very considerable textile industry, especially cotton and wool ; but the special development was on chemical lines, which means in modern life exceedingly wide interests, associated with agriculture and explosives, leather and alcohol, glass and dyes, etc. It is peculiarly interesting to geographers and others interested in the influence of environment (e.g. the apparent association of initiative with marine and organization with continental environments) that many of the inventions exploited and perfected by the Germans were borrowed from elsewhere, especially from the research chemists of Britain.

Switzerland. The geographical disadvantages of Switzerland are obvious—no coast, no coal or iron, little fertile soil ; but it has some of the commercial advantages of Germany in its central position and a similar proportion of skilled and industrious labour, while its scenic attractions depend largely on conditions very favourable to the development of immense supplies of water-power everywhere.

Under such circumstances the natural policy was, like that of an essentially inland town such as Birmingham, to specialize on lines demanding a great percentage of labour on a small percentage of raw material; and the radiation of four great rivers—Rhine, Rhône, Inn, and Po—from the heart of the country has made it the most important junction of railway routes in Europe, though the relief of the region made railway construction very expensive. Indeed, it was only the importance of the area as an obvious "link" between north and south and between east and west that justified the expense on the railways.

The one great local asset apart from—though associated with—the scenery was in the abundance and excellence of the mountain pasturage, the real alp. In the cool, moist climate of the highlands the sun-power and the unfailing moisture make it practically impossible for the plants to develop much woody fibre, so that their food value is very high, especially for the production of milk; and in a country where the topography makes transport difficult, the milk is likely to be converted into forms easy of transport, e.g. cheese, condensed milk, and milk-chocolate.

The long winters favoured ages ago the rise of cottage industries, e.g. the carving of wood and the making of ingenious small metal objects; and French Switzerland is now as famous for its production of such articles (watches, jewellery, optical and musical instruments), as German Switzerland is for its textiles, especially silks, at Zurich, Basle, and other places along the St. Gothard route with its easy access to Italian supplies of raw silk and cottons in St. Gall.

Of course, there is also an Italian Switzerland, for this mountain refuge has attracted "exiles" from every side; and the bi-lingual or tri-lingual character of the people has been a further asset in the development of their commerce, as in their facilities for entertaining tourists of many nationalities.

Scandinavia. The Alps are obviously a much greater barrier than the Baltic Sea, but continental Europe is more intimately associated with Italy than with Scandinavia; and the reason is partly historical, partly geographical. For Europe, as a separate continent with a culture of its own, has been evolved from the south-east, not from the north-west; and through Italy, but not through Scandinavia, there runs a great north-and-south thoroughfare to one of the most densely peopled regions on the globe.

Apart from this regional isolation, structure, relief, climate, and physical history have all combined to "isolate" man in this area, especially in NORWAY. Most of it consists of very old and naturally infertile rock, and off most of this any possible thin covering of soil was swept in the Great Ice Age; and the ocean edge was "cracked, washed, and ground"—ground by ice—into a chaos of branching and precipitous fiords, protected from storms and from the Arctic overflow into the North Sea by a fringe of islands. Except in the south-east, the land was never able to provide any store of food for man, but the quiet waters within the island-fringe teemed with fish; and the warm S.W. winds and the Gulf "drift" kept them absolutely ice-free the whole year round, even far within the Arctic Circle, while along most of the fiords there was enough timber to provide every one with house and boat. Starved by land, then, the Norsemen became the most purely maritime people round the coasts of the Atlantic.

The forests still are of considerable value, supporting —especially in the south-east—various "wood" industries (lumber, pulp, paper, etc.); and these industries are very easily supplied with water-power. This is the second great asset, and Norway has developed more water-power *per caput* than any other country in the world. Fully 5,000,000 h.p. units are available, and some is already used in the electric smelting of ores; but Norway (except in her new acquisition of Spitsbergen, with its coal, iron, copper, and lead) is very poorly supplied with metals or minerals of any kind, and so attention is directed to the one substance which is both abundant and free, i.e. the air. By the use of cheap electric power, then, Norway combines free atmospheric nitrogen with other substances to make manures and other valuable compounds.

The three typical exports, then, are: (1) fish, (2) "wood" products, (3) nitrates, etc., but hitherto these have not been sufficient to prevent an adverse trade balance; and so far as Norway has been, and is, able to prevent this, it is due to her mercantile marine, which is one of the best in the world. Before the War it was at least equal to that of France or Japan, and did a great deal more carrying for foreign nations. Jealousy of it seemed to be responsible for much of the brutal treatment which it received from Germany during the War—even inside the Norwegian 3-mile limit.

DENMARK, as we have seen, has specialized in dairy farming, based on scientific culture of a rather poor soil. It is practically devoid of minerals and forest, but has one valuable asset in its position, which commands the Baltic basin strategically and commercially. Copenhagen is a great free port, which collects and distributes for the whole of that basin; and the full importance of its position can perhaps be gauged from the fact that the Danish fisheries are slightly more valuable than even the Norwegian, i.e. far above the British, though not reaching the value of the Canadian.

SWEDEN is much better endowed with natural wealth, especially in these days when few things are more productive than good forest. Fully half the country is covered with forest, some 90,000 square miles of it, containing a large percentage of good timber; there are rich deposits (15 per cent of the total reserves of European ore) of very fine iron; the water-power equals that of France, and is very little behind that of Norway; and 10 per cent of the area is good arable land, while a further 3 per cent is good meadow.

The disadvantages are: (1) the high latitude, with its continental extremes, i.e. long, dull winters, with rivers and lakes frozen, and therefore water-power curtailed, (2) the absence of coal, a great drawback before the (recent) development of water-power, and (3) the restriction of the good arable land to the southern part of the area.

The continental climate is, however, very favourable to the forest industries, and the long eastward slope of the peninsula gives Sweden 100 rivers admirably suited to the floating of timber, and to the working of saw-mills, so that Sweden has recently been the largest exporter of timber in the world, Britain being by far her best customer. Of course, a good deal of the forest is producing wood-pulp rather than timber; but pulp and paper are themselves very important nowadays. Bark, charcoal, and matches are subsidiary products. Indeed, in no other country in the world, except perhaps Finland, is the forest wealth of such high relative importance.

The iron industry is, however, actually of more importance, providing—in all its aspects—about 80 per cent of the total export values. The mass of the ore is of very high grade, but is in a very high latitude, where the cost of smelting has been more or less prohibitive;

but the field is so near to the ice-free Norwegian coast at Narvik that the ore can be exported as easily in winter as in summer (via Luleå). The smelting industry of Central Sweden (Dannemore), where the ore is of equally fine quality, has depended on charcoal, and this accounts for the fine quality of Swedish steel—the old basis of our Sheffield cutlery. Indeed, some of your so-called "Sheffield" blades are made by Swedish firms, e.g. "in" Dannemore, but the actual work is done—by these Swedish firms—in Pennsylvania! Some light is thrown on this by the fact that the bulk of the ore is phosphoric, and cannot be converted into steel with charcoal; and so her lack of coal compels Sweden to export it. But the working of the smaller supplies of non-phosphoric ore with charcoal gives the finest possible product.

The shorter winter, with a greater exposure to Atlantic influences, has tended to restrict the development of water-power to the southern half of the country, especially to the Dal and the Gota; and this has favoured the "export" of power, e.g. to Denmark. Here, too, there is the further advantage of a good waterway, via Lakes Vener and Vetter, right across the country from Stockholm to the ice-free port of Göteborg; and the railway mileage is the greatest *per caput* in Europe.

NOTE

1. Out of nearly 2,700 miles of canals in England, carrying annually about 15,500,000 tons of freight, over 1,500—carrying well over 13,500,000 tons—are entirely independent of the railways. If the prospects of canal development are as rosy as the propagandists urge, why do they not buy up and work these free canals?

2. The heaviest item of cost in transport is transhipment, i.e. porterage; and one-fifth of all the work done in railway goods sheds is transferring goods from one truck to another. With decrease of total tonnage and in size of consignments the expense of this is always increasing.

3. Four-fifths of our total railway tonnage is of minerals, coal being far the most important; and London alone returned last year nearly 8,385,000 tons of coal delivered by rail against 44,000 delivered by canal!

CHAPTER XIV

EUROPE (2)

EVEN a political map of the worst possible type shows at a glance that nearly half Europe is very like its parent continent of Asia in solidity and lack of articulation, and this means that it is rather "un-European" in its geographical conditions and their influence on man. The best line of division between the two parts is drawn as the arc of a circle with its centre in the Ural-Caspian gap, and its circumference running from Luleå to Salonika. East of this line we must expect to find the standards and the stages of development different from those to the west of it.

The Baltic States. Finland is almost twice the size of the three other new Baltic States put together, but it does not contain twice as many people as even little Lithuania. The four states are in the latitude of Hudson Bay, and Finland is both the farthest north and the most continental in climate. It consists, too, mainly of a vast slab of very old rock, like that round Hudson Bay, which is very infertile and yet deficient in minerals. Thousands of square miles are covered with lakes, swamps, and glacial debris; the growing season is very short; and the only assets are the forest cover and the character of the people.

The Finns are, like the Magyars, an Asiatic people, who seem to have shed all bodily and mental traces of their origin, and who are now one of the most able and most cultured peoples in Europe; and they have succeeded in winning for pasture and agriculture respectively about 4 per cent and 6 per cent of their barren land, and their extreme cleanliness has made them very successful in dairy work. Hundreds of co-operative factories have been established in the south of the country, and there is a large export of butter.

But the great source of wealth is in the forests. Well over 40 per cent of the whole area can be labelled "waste," but good timber covers 50 per cent; and the rough surface and the physical history of the area have provided a wide distribution of water-power, available for sawmills and pulp and paper mills.

The northern half of the three "Balt" States is also old rock, but less old than in Finland, while the south is much younger and more fertile. Agriculture (rye and barley, potatoes and flax) is more prosperous, therefore, and forestry is relatively less important; and both the Esths, who are akin to the Finns, and the Letts are able and cultured peoples. Forest products and butter are the great exports of Esthonia, and forest products and flax are those of Latvia. Riga, though of much less importance than in 1913, is a much larger and more important place than Tallinn; and Latvia possesses in Libau and Windau two practically ice-free ports —thanks to their direct exposure to the S.W. winds off the Atlantic. Lithuania is a country of Slavic peasants, with few resources, and can scarcely prosper as a separate political unit.

Poland. The outstanding disadvantage of Poland is its historic heritage as a country of landless Poles partitioned between and grossly ill-treated by Austria, Russia, and Prussia, particularly by Prussia, though the political and economic organization was better in Prussian Poland than in the other two areas.

While 45 per cent of the area is cultivated, and 20 per cent is pasture, 25 per cent is forest; but the forests are poorly managed, and the various forest industries and products are less important than they should be. The mineral wealth, however, is great—greatest and most developed in the old German area, especially in Upper Silesia; and while this ex-German area is very rich in coal and zinc, the ex-Austrian area is very rich in salt and oil. There is also a considerable amount of lead and nickel, but the supplies of iron are neither abundant nor of good quality.

But Poland is essentially one of the areas in which the economic geography is dominated and vitiated by the political geography; for the recent history of one of its great neighbours and the current politics of the other create a situation of extraordinary difficulty. The Soviet Union is the main cause of the present unrest in both Europe and Asia, especially in its immediate neighbours; and the history of Germany from 1871 to 1913 caused her to be—rightly or wrongly—an object of fear and suspicion on the part of weak states. But to-day Germany has not only lost much territory to Poland, been cut off by the Polish Union from East Prussia, and been compelled to divide the mineral wealth of Upper Silesia, but has also special relations with Soviet Russia. So long as the basis of economic progress is security, these facts are adverse to the prosperity of Poland.

Against this must be set the mineral wealth and the commercial location. Poland stands now third in Europe for the production of coal, producing about 3½ per cent of the world's supply; and, with immense stores of salt and producing 15 per cent of the world's zinc, the republic has great opportunities for developing chemical and metal industries. Mining is already nearly as important as the textile trade, which employs 40 per cent of the population, mainly in Lodz and Warsaw; and, as the latter has reached a much more advanced stage, the scope for improvement in the former is very large. The first coal "boom" (with an export of over 12,500,000 tons in 1923) was mainly due to the export to Germany (8,000,000 tons), and that is not likely to be repeated; but there was an export of *c.* 12,000,000 tons in 1926—to Sweden and Denmark, Italy, Austria, and Czechoslovakia—when, thanks to our coal strike, serious inroads were made on "British" markets; and Poland has been able to hold and even to extend this advantage, so that in 1929 her export was over 14,000,000 tons.

The position between east and west, agricultural and industrial peoples, is advantageous for commerce in spite of high tariff barriers; but the financial strain is great, the people are far from being united, and the political dangers—internal and external—are far from being imaginary.

Danubia. These Danubian lands are practically the old Austro-Hungarian Empire and its flanking areas, and they include a great ring of mountainous country set round the two riverine plains of the Middle and the Lower Danube. As a whole, the region is incoherent, its mountain barriers and recesses favouring the isolation of political units and the survival of diverse tongues and racial rivalries. The northern part suffered much from "peaceful penetration" by Germans, and the southern part from the open tyranny of the Turks; religious antagonisms have been almost as vicious as the racial, and the only unifying factors have been the navigable Danube and—to a less extent—the Orient Express Railway.

The two riverine plains—in Hungary and Rumania—are, of course, specifically agricultural, and the standard of agriculture in Hungary is high. The mountainous north-west, with its coal and its water-power, is largely industrial, especially in Bohemia and Austria. And the "Turkish" highlands of the south are unstable politically and backward economically. Rumania and Bulgaria are essentially "Black Sea" countries; Czechoslovakia is mainly a "North Sea" country; and the other three units are naturally "Adriatic" countries. This emphasizes their need of free access to Trieste and Fiume.

Two of the countries in this area, Hungary and Czechoslovakia, deserve some detailed attention—partly because of the character of their people, Magyars and Czechs, partly because of their geographical conditions. The peoples are amongst the highest types in Europe; and the economic geography of Czechoslovakia is as full of promise as the political geography of Hungary is full of difficulty.

Czechoslovakia. Even in Czechoslovakia the political geography is not favourable. The shape of the country is adverse to easy government and to easy defence, and its position exposes it to possible attack from five neighbouring states; in any case, it lies in the centre of the most unstable belt in Europe, where the possibilities of war breaking out can never be ignored. Here, again, as in Poland, behind the problems of economic prosperity are those of political security; but the natural boundaries of the country are much stronger than those of Poland, and the people are much more united and content. The commercial position is very similar, but slightly inferior, to that of Poland, while the natural resources are at least equally great.

The country is accessible by river as well as by rail, especially by the Elbe and the Danube; and it is rich in minerals, with good coking coal at Teschen, though a considerable proportion of the coal is "brown," and the iron is neither very plentiful nor of high grade.

Agriculture is fairly scientific, and all the four hardy grains are raised in about equal quantities, while sugar-beets and potatoes are of prime importance. Indeed, the country rivals Germany for its export of sugar. The forest is also sufficient for all local demands and for some exports.

Above all, while fully 40 per cent of the area is arable, 40 per cent of the population is engaged in industries —industries of long standing and a high standard. When it was part of the old Austro-Hungarian Empire, the country was credited with 83 per cent of the coal and 60 per cent of the iron raised in the empire, and its industries produced 95 per cent of the sugar, 85 per cent of both the glass and the hemp goods, 80 per cent of the woollens, and 75 per cent of the cottons. China and glass, beer (Pilsener) and gloves are also important. Several of the great trunk railways of Europe pass through the country.

Hungary. Hungary to-day illustrates more clearly than any other country both the immense harm that can be done by politicians who are profoundly ignorant of essential geographical conditions, and the close bearing of political factors on economic progress. Let us ask first why the country can scarcely fail to be a source of political danger to peace, and then how its political geography is impeding economic progress!

The area is one of the most natural units in the world. Inside it, especially on the Great Alföld, there are all the geographical conditions necessary to encourage the similarity of occupation, the intimacy of intercourse, the identity of interest, the unity of sentiment, which make for strong nationality. As the floor of an old lake, it is also low, level, fertile, and compact, with a climate that makes it naturally a region of prairie or steppe.

Over the 50,000 square miles (= England) of this plain are scattered the 10,000,000 Magyars of the world. They form, therefore, a single racial unit, with no kindred people elsewhere to whom they can look for help or even sympathy; but 2,000,000 of them have been cut off from the rest by a frontier which violates every known principle of self-determination and every known geographical quality that a frontier ought to possess. It is like making a frontier out of the Regent's Canal, and forcing Marylebone, Finsbury, and Hackney to keep to the north of the canal in business and pleasure. Every street leading southwards would have a toll-bar, and payments and passports would be needed to get to Westminster, Holborn, and the City.

About 1,000,000 of these Magyar exiles form a solid block along and just beyond the northern frontier of Hungary; and they have eleven railways leading into Hungary, all blocked by a tariff frontier, while only five connect them with their new political unit, Czechoslovakia. Another 1,000,000 form two solid blocks along and just beyond the eastern and southern frontiers; and they have thirty railways leading into Hungary against ten into Rumania and five into Yugoslavia. The lands in question are very fertile, but do not contain any minerals—for the frontier was drawn so as to deprive Hungary of all her half-dozen salt fields and all but one of her iron mines—and so they could not form or support any technical base for the manufacture of armament or ammunition.

In any case Hungary was, is, and ought to be, essentially agricultural, with her fertile soil and her magnificent peasantry; but her fertility is closely connected with the *régime* of her two great rivers, Danube and Theiss, both of which are liable to sudden and violent floods. For this reason the Government, long before the War, had taken every possible precaution against harm from the floods; and far the best precaution against such floods is regulation of the *upper* waters of the river at or above the place where it drops to "lowland," i.e. below about 600 ft. above sea-level.

Unfortunately, the belt of maximum fertility in Hungary is in the Theiss Valley, where the danger from flood is also at a maximum; and so the upper basin of the Theiss was elaborately organized, with wide afforestation and complete regulation of the river banks. The whole of the forests and nearly 400 miles of the regulated rivers have now been put *just* outside the Hungarian frontier, and there is no real protection left against the floods, with their destruction of property and poisoning of human health.

In the old days the local population was responsible for the condition of all embankments, sluice gates, and pumping stations; trained engineers, guard houses, day and night patrols, were essential parts of the system; and every village had to send in every day—to the Department of Agriculture in Budapest—a report on any rainfall, the height of the river, etc. Now Slovaks and Rumans send in no reports; they need timber, and want cash; and they are above flood level or beyond the flood area. They have, therefore, no scruples about felling the forest "cover." And so there have been terrible floods in Hungary, e.g. Veoztö and Okânz suffering along the Theiss—from no fault of the Magyars—as Natchez and Baton Rouge suffered along the Mississippi from the bland and criminal diversion of Laurentian water into the Mississippi by Chicago.

Under such circumstances it is obviously unreasonable to expect either that the farmers along the Theiss will be contented and peaceful, or that the bread-supply of Europe—especially the supply of very fine flour—

will not be diminished. And, besides these general conditions, there are many particular details which, if less harmful, are even more irritating. For instance, the frontier was drawn in such a way that a dozen of the famous schools of agriculture are left just outside Hungary, a maximum loss to the Magyars and a minimum gain to the Slovaks, who are a very backward people, quite uninterested in scientific agriculture. The same policy has put a score of great sawmill centres, four out of the five great flour-milling centres, and two out of the three great sugar-refining centres, just outside the Hungarian frontier.

Similar interference with natural conditions is found in other spheres, especially transport. If we compare a railway map of Hungary in 1913 with a caravan map of the same area in 1513, we find that the lines run definitely along the old tracks, showing that they are the *natural* lines of movement. These natural routes are utterly ruined now by tariff barriers, at least for export purposes. Far the most important line in 1913 was that from Budapest to Marchegg, on which over 25 per cent of the whole export trade was moved; and this line has been cut and alienated within 20 miles of Budapest. The second greatest railway centre in 1913, Nagyrârad (Grossvardein) has also been put just outside the frontier.

The details could be multiplied almost infinitely, but there is no need to do so, for our essential point is obvious. No doubt, the case of Hungary is worse than that of any other country, but it occupies a very important location in Europe, and its work as a bread-raiser is very valuable. We may, therefore, take it as an ideal example of the close connection between political and economic geography; and we must be ready to admit that internal discontent—such as may even cause external trouble—is at least understandable, if not actually reasonable and legitimate.

The Mediterranean Lands. The earth movements which produced the Mediterranean Sea, were associated with elevations as well as subsidences; and the peninsulas contain masses or lines of highland, and hang from a line of young folded mountains, e.g. the Pyrenees and the Alps. The peninsulas were, therefore, isolated from the rest of Europe as well as from one another, and the whole basin is divided into a number of separate states with diverse tongues.

But, of course, these lands must be classed with those discussed in Chapter XII and not with the relatively backward lands discussed in this chapter.

The world position was very favourable to commerce in the Middle Ages, and has been so again since the construction of the Suez Canal; and the natural ease of access has been emphasized by the attraction—to tourists and invalids—of bright and mild winters. This is now of vital importance, especially to Italy, as the natural resources of the area are relatively small and lacking in variety.

From the agricultural point of view, the temperature and the rainfall of early winter are as favourable to the growth of wheat and barley as the temperature and the drought of late spring are to their ripening and their harvesting; but the rainy season is rather warm for rye, and the hot season is rather dry for maize. As a large proportion of the land, even in Italy, is not well suited to agriculture, there has always been a "bread" problem in the area. And, thanks to the paucity of cows, there has also been a "milk" problem, most of the cattle being reared for draft work, and much of the sheeps' milk being converted into cheese. For bread and milk there are such substitutes as chestnuts and olive oil. On the other hand, the mild winters are exceedingly favourable to the raising of "early" vegetables for export, e.g. truck loads of cauliflowers coming from Naples to London in February; and the dry summers are equally favourable to the "curing" of grapes—e.g. the raisins of Malaga and Valencia and the currants ("Corinth" grapes) of Greece. Where irrigation is easy, oranges and lemons thrive, e.g. round Valencia; and where temperatures are too low for olive and citrus, mulberries thrive, e.g. in Lombardy, where, too, there is cheap skilled labour.

The mineral wealth of the area is not really abundant, though varied; and its working is often dependent, e.g. the Sicilian sulphur, upon cheap labour. Spain is relatively rich in iron and copper, coal and quicksilver, as Italy and Greece are in marble; but there is a general lack of coal throughout the whole area, compensated to some extent, especially in Italy, by the water-power. Spain produces nearly half—though not the best—of the olive oil in the world, and Italy produces over a quarter—and the best—of it; but the chief export from Spain is wine, e.g. sherry, and the chief export from Italy is silk. The second export from Spain is fruit, especially oranges and almonds, and the second from Italy is textiles, especially cottons. Barcelona, at the "European" end of the old Moorish huertas (irrigated gardens), is the principal seaport of Spain; Milan, at the foot of the Alps, is the principal industrial centre of Italy.

PART VI
REGIONAL GEOGRAPHY

CHAPTER XV

NORTH AMERICA (1)

THE important geographical factors in North America are rather different from those in Europe, and they may be studied in a rather different manner. Canada alone is almost comparable in size with Europe, and the U.S.A. territory (including Alaska) is nearly as large as Canada; but both areas are far from being overcrowded. Of course, mathematical averages are misleading more often than not in geography, especially averages of annual temperatures and rainfalls, many areas never having their average annual temperature except for a few days in spring or autumn; but the average density in the U.S.A. is not very much above 30 to the square mile, and in Canada not 3. Here, then, there is still more reason for emphasizing the agricultural base.

Then, political geography is more or less unimportant. Such problems as we have been discussing with regard to Hungary, do not—and cannot—occur. Even in the U.S.A., the Federal Government is nominally and legally supreme in all vital matters, e.g. control of the rivers. Chicago, in diverting from the St. Lawrence to the Mississippi every day more water than passes over the American Falls at Niagara, has been violating U.S.A. law as well as the International Treaty. Of course, the daily "deluge" prevented the possibility of there ever being natural low-water on the Mississippi, i.e. natural room for even normal flood water. Hence the dreadful floods.

Economic Units. Important divisions in the U.S.A., therefore, are not political units, but economic, e.g. the Spring-Wheat Belt, the "Corn" Belt, the Cotton Belt. These are determined to some extent by historic and economic factors, but their limits and character are essentially geographical. Thus, in the Spring-Wheat Belt, other hardy cereals, especially barley and oats, are grown—along with flax; but it is mainly an area of spring-sown wheat under "extensive" (and therefore exhausting) cultivation. And the basis of it all is the combination of low relief and fertile soil with long, cold winters and scanty early-summer rains.

Wheat is much hardier than "corn," i.e. maize, and can be grown much more widely; and so in an area suited to it the latter is likely to occupy a greater proportion of ground than wheat generally occupies. But this "Corn" Belt is devoted specially to the raising of pigs ("hogs") and cattle, and some of the other foods needed by these animals are also grown in the area, especially grass crops and oats. The same low relief and fertile soil are here combined with a longer summer and a higher humidity, the nights specially being more humid than farther north; and the summer rains are heavier and more frequent.

In the Cotton Belt only a small proportion of the area is under cotton, but this is far the most important crop. The prime factors, however, are a long, moist, frostless, sunny summer and abundance of cheap labour; amongst subordinate factors are a light, limestone soil and the presence of salt in the soil and in the air. Once the cultivation became mechanical, the "Gulf" prairies were sure to monopolize the crop; and

Texas has become the most important cotton state because it has the largest area of prairie.

All these belts, like the Laurentian Pasture-and-Hay Belt, are dependent on the natural rainfall; and they are found to the east of a line which is roughly marked in the U.S.A. by three very clearly *geographical* indications—longitude 100° W., the 2,000-ft. contour, and the 20-in. isohyet. In Canada, however, this north-and-south line follows the north-westward trend of the Cordillera, with a consequent narrowing of both the Cordilleran barrier (to the rain-bringing Anti-Trade winds) and of the Dry Belt (cf. p. 143).

Parts of this vast belt, especially the northern half of the Coastal Belt, have quite enough rain for agriculture and horticulture; but, except in the extreme north-west (northwards from Oregon), the rainfall is strictly seasonal, and over the mass of the U.S.A. Dry Belt the three summer months do not usually produce even 5 inches of rain.

Dry Farming and Irrigation. Under these circumstances, the southern half of the U.S.A. Dry Belt is being developed by various schemes of dry farming and irrigation. Both are really intensive systems, opposed to the extensive agriculture of the Humid Belt; and so both make great demands on time and labour. The irrigation projects have been the more successful because of the practical certainty of an annual "return," whereas by dry farming there is no *certainty* of a crop even every second year, though in some parts a crop may be won every year. For dry farming simply means cultivating land in such a way as to conserve moisture and minimize evaporation, keeping the subsoil firm and the surface always loose; and the cost of time and labour is so great that the system is profitable, and can compete with the careless extensive system of the

Humid Belt, only because it utilizes land which would otherwise be useless, and which is therefore very cheap. The range of suitable crops is limited, but includes several that are very useful on a cattle ranch, i.e. useful to the only farming industry for which the belt is naturally suited.

Of course, lands that are suitable for dry farming may also be put under irrigation; but, again, the total area treated cannot be very great, and the demand for labour is always very great. In this case, too, there is the cost of constructing and maintaining the machinery of water supply; and, as wells are of little use in this connection, water has often to be brought great distances. Where, as in the U.S.A. Dry Belt, the seasonal variation of rainfall even on the mountains is considerable, there is the further expense of storing surplus water from the wet season to the dry season. The clear advantages of the system, then, are only two—the high normal fertility of dry soils (out of which the fertile elements have not been washed by rain) and the opportunity of supplying different crops with the exact amount and distribution of water that they need.

The problems of irrigation agriculture are more numerous and more intricate than those of dry farming, particularly because irrigation can so easily do harm both to the soil and to the crops—an obvious impossibility under dry farming; and the dangers are specially threatening in lands of "hustle." Even in India cautious progress in wholesale irrigation has produced alkali problems which were unknown during all the centuries of "petty" native irrigation; and it is now definitely determined that the best crops of wheat in North-western India are grown on irrigated land which has not had one drop of water *after* the sowing of the seed.

In this Dry Belt of North America, the dangers have not been avoided. Fully 15 per cent of the irrigated land in the U.S.A. has been badly damaged in this way by the bringing up and accumulating of "alkali," and yet 75 per cent of the total irrigated land is under "petty" control, i.e. under private individuals working alone or with a partner, or in co-operation with other private individuals.

The Wheat Belts. Wheat was a native of the Mediterranean basin, i.e. it was evolved in a climate with a moist, mild winter, ending in a hot, dry summer; and fully 75 per cent of the world's wheat crop is still "winter" wheat, though most of it is grown now in climates with summer rain—in various quantities—and so suffers from rust. It is much the best grain for making bread, because of its high gluten content, the "glue" giving the dough "strength"; and, as we have seen, the percentage of gluten has an obscure connection with extremes of temperature. Obviously, where the winter temperature is extreme, the plant must be protected—by snow; and, therefore, the snow must fall *before* the temperature becomes too low. A high summer temperature is harmful to wheat only when accompanied by high humidity, when fungoid and other pests are fatal.

It is the typical climate that makes the prairies the great wheat-raisers of the world. Of course, the generally level surface favours both tillage and transport, especially by machinery; and their dark and heavy soil attracts heat, and promotes the formation of protein (gluten). There are also obvious economic factors at work, especially in relation to cultivation and transport. But the climate is the dominant issue.

There are three great wheat belts in North America, two on the prairies and the third on the Pacific hinterland. The Northern and Southern Prairie Belts are separated by the "Corn Belt," the Northern Belt producing hard spring-wheat, and the Southern producing soft and less-hard winter-wheat. The Pacific Belt, though in the latitude of the hard Spring-Wheat Belt, produces soft and starchy wheat, whether as a winter or a spring crop. The northern prairie (45°–55° N.) is specifically a wheat area, but the southern is a mixed area; there wheat is limited by maize ("corn") and even by cotton, and damaged by unstable winter temperatures (alternate freezing and thawing) and by the humid heat in summer.

The prime economic factors behind the overwhelming importance of the prairie in this connection are three —the ease with which wheat can be handled in bulk, the wide extension and combination of rail and river transport, and the provision of elevators for cleaning, grading, and storing the grain. All these are illustrated in Winnipeg, the greatest wheat-centre in the world, and in such centres as Minneapolis and Chicago. And flour-milling has become a typical industry in such centres as well as in the ports of consuming areas, e.g. Cardiff and Liverpool.

The future in the wheat trade lies with Canada, not with U.S.A., still less with Russia or Argentina. The northern limit has certainly not been reached, and the prairie population is not yet 2,000,000, though the total population of Alberta, Saskatchewan, and Manitoba is just over 2,000,000. At present no great addition to the world's supplies is likely to come from the expansion of wheat in crop rotations or under irrigation; but the yield per acre can easily be increased by better culture and by the use of varieties that are more productive and more resistant to disease, drought, and frost. And in all these respects Canada already leads the way.

Other Cereals. Rye is nearly equal to wheat in protein and food value, though the flour is inferior in colour and in taste; and both rye and barley are grown in the Spring-Wheat Belt, the rye mainly because it is tolerant of poor, acid, and badly drained soils, such as are found round the Great Lakes, and the barley mainly because it needs only a short growing season. Oats are less hardy than rye, as maize is than wheat, and require, like maize, more moisture than wheat; but, as they are a spring crop, they are found widely in two areas, the St. Lawrence basin and the "Corn" Belt, which raise about 35 per cent of the whole world's supply. The Laurentian summer is admirably suited to the crop; but the "Corn" Belt has too fertile a soil, too many storms in early summer, and too humid a heat later. Then why are they grown so widely here? For economic reasons. They make an excellent rotation with maize and first-rate fodder not only for horses, but also for young "meat" animals.

Maize. "Corn," i.e. Indian corn or maize, is as clearly the chief grain crop in U.S.A. as wheat is in Canada; and it is still the bread staple in Mexico, as it was everywhere during the early days of European settlement in North America. At present the U.S.A. produce about 70 per cent and Mexico about 5 per cent of the world's supply; and the former will continue to dominate in this respect until the further development of South Africa. Maize is a native of tropical plateau, not of temperate plain; and eventually the U.S.A. prairie will not be able to compete, in either quality or quantity, with the South African savanna, where "mealies" have been a Bantu staple for centuries.

Apart from the rough areas and the northerly latitudes—where it can be grown as a fodder, but not as a grain crop—there is a very large belt of prairie in the

U.S.A. where the climatic conditions are very favourable, the best of it lying between 85° and 95° W. and 35° and 45° N. Inside these limits there are at least five months during which both days *and nights* are warm and where 11 inches or 12 inches of rain fall during the critical 11 or 12 weeks; and this rain is mainly in thunder-showers, and is therefore accompanied by a high percentage of sunshine. The dark, rather sticky, soil again attracts heat and conserves moisture. On the north and east of the belt the summer is too cool or too short, and on the west it is too dry; but to the south conditions are very favourable, and maize is there much more widely spread, though much less important, than the cotton.

While rather more expensive than wheat to produce, it is very much more prolific; and, as four-fifths of the whole crop is fed direct to pigs (40 per cent), draught beasts (20 per cent), and cattle (15 per cent), the cost of harvesting is very small. For the same reason, there is very little commerce in maize. Three separate States —Iowa (440), Illinois (310), Nebraska (240)—produce over 200 million bushels a year, and four others (Minnesota, Ohio, Missouri, and Indiana) nearly reach the same total.

Other Food Crops. Many other food crops are grown in North America, especially fruits and vegetables; and usually the production is quite normal and very similar to that in Europe. We may just glance at some of the conditions, noting the abnormal as well as the normal.

For instance, the most widely grown vegetable is the potato; and, quite naturally, the early crops are grown in the lower latitudes, e.g. in Florida. But the potato, like maize, is a native of the Andean plateau, and prefers cool and moist to hot and dry weather. The Laurentian basin is much more suited to the crop, therefore, than the mass of the U.S.A. The crop also does best on light, sandy loams, which are abnormal in the Mississippi valley. It is, therefore, of little importance south of Pennsylvania; and much the largest area is in Quebec, and the highest yield is across the international frontier in Maine, especially the Aroostock area.

The apple, again, is very widely grown; and, therefore, commercial supplies come mainly from areas which are very favourable to the crop or very accessible, or both. The low rainfall, the late frosts, and the hailstorms of the interior, are adverse, even where the access is easy; but the climate round the Great Lakes is fairly favourable, for the influence of the lakes delays bloom in the spring till dangerous frosts are over, and delays frosts in the autumn until the crop is safely gathered. Both Ontario and New York—and, to some extent, Michigan—are favoured in this way.

The natural apple areas are, therefore, in the Maritime Provinces of Canada and the New England States, the latter raising specially "Baldwins"; the "artificial" areas are in the Pacific hinterland, where—alike in British Columbia, Washington, Oregon, and California—the industry is largely dependent on irrigation and highly specialized. Of course, the cost of production is high, and markets are very far off; but dangers from frost and fungi are at a minimum, yields are very high, and the large amount of sunshine gives the fruit a beautiful appearance.

At the same time, for quality none of these irrigation apples can really compete with the "natural" fruit, especially that from Nova Scotia, where the Annapolis valley combines almost all possible advantages for raising apples of superlative quality ("Northern Spy," "Russet," and every kind of pippin). Indeed, the whole character of the industry illustrates most of both the geographic and the economic aspects of a typical problem in economic geography.

✓ **An Apple Paradise.** Though almost the whole of the Maritime Provinces is suitable for the growth of apples, the Annapolis valley is the most suitable. The orchards are found on the slopes and the crests of low hills that are scattered over the floor of the valley and on the lower slopes of the ranges that enclose the valley; here they have good drainage, and catch a maximum of sunshine, while cold air gravitates away. The basin runs for 100 miles N.E.-S.W., with an average width of about six miles, parallel to the Bay of Fundy, from which it is separated by a low and narrow belt, while a belt of highland flanks it on the east, cutting it off from the fogs and storms of the Atlantic.

The influence of the Bay on the climate is seen in the damp Augusts and the delay of autumn frosts, while that of the Continent is seen in the dry February and the short spring; and the conditions are almost perfect. The cold, dry February delays bloom till the danger of frosts is minimized; the short spring makes it impossible for the tree to produce both leaves and fruit, and under such circumstances good trees will always make fruit; and the warm, damp August flushes and swells the fruit.

In the factories of Halifax and Lunenburg, across the waterparting, the slack time of the year comes in autumn; and so there is abundance of "factory" labour for the picking and packing of the crop. The area is also so compact that all the (small) growers have been easily organized in a Co-operative Growers' Association, with a central committee able to transact all business easily and promptly; and the position of the valley gives exceptionally good transport. By land it has a shorter and cheaper rail journey than any of its rivals, e.g. in Ontario and New York; and, by sea, Halifax is *on* the Great Circle route from Philadelphia, New York, or Boston, to Liverpool, so that continuous shipments can be made weekly or half-weekly all through the late autumn and early winter. For the same reason, too, freights are low; and the constant shipments and the smallness of the consignments (generally less than 20,000 barrels) obviate the need for storage at either end of the route.

Sugar. A remarkable contrast to this is presented by the cane-sugar industry of Louisiana. Sugar-cane normally needs more than twelve months to mature, and so must face a "winter"; but frost is fatal to it, and so there must be no frost. But in Louisiana a few days of frost must be expected every winter! Then why, and how, is cane-sugar grown? It is really not much more than a stupid survival of tradition, based on cheap negro labour. The fertility of the reclaimed marshlands, the abundance of subsoil water, the percentage of salt, the nearness to the Mexican Gulf, are all favourable factors; but none of them can prevent the occurrence of frost. The only course is to have artificial protection from frost, to breed rapidly-maturing varieties of cane, to treat the plant as an annual, to cut it before it is really mature! In other words, they spend more on the cultivation than the results really justify, and have to be content with a harvest inferior both in quantity and in quality to that of neighbouring rivals, e.g. in Cuba and Porto Rico, which supply 60 per cent of all the sugar consumed in the U.S.A.

The U.S.A. beet-sugar industry is in a much better position, and provides over 17 per cent of the sugar consumed, i.e. nearly four times as much as the Louisiana cane; and, of course, its distribution is very different.

A large area in the U.S.A., as in Canada, is quite suitable for sugar-beet; but all of it can be classified with fair accuracy under one of two heads. Like all tap-rooted plants, beets require a deep, loose, and well-drained soil; the water supply need not be great, but must be well distributed; and a cool, dry autumn greatly increases the sugar content. Obviously, these conditions suggest irrigation in a dry belt—which is seldom densely peopled; but beets require a great deal of hand labour, and a dense population at once supplies an immediate market. Colorado produces more sugar than even Louisiana, and both Utah and California produce nearly half as much as Colorado, of excellent quality and relatively cheaply (except for transport); the other area is centred in Michigan, spreading into Ontario and Ohio. South and south-west of this area, sorghum cane is raised; and north and north-east of it, especially in Quebec, large quantities of maple sugar are raised.

CHAPTER XVI

NORTH AMERICA (2)

OUR survey of the more advanced countries in Europe (Chapter XII) shows that there are three main factors for the rise of industries in a particular area or a particular spot, and the historical order of their importance is: (1) raw material, (2) "power," (3) markets. All industries in the earliest days must have risen where there was some material on which to work, and the power was all "hand" power, and the articles were made for local use; and it might seem reasonable that something of the same kind should be true of "new" countries even to-day—or, at least, from the time that Europeans settled in them.

This, of course, is far from being the case; and the reasons are fairly obvious. The vast number of products used in modern industry, the immense complication of the processes, the annihilation of space and time by electricity and other "power," especially with regard to transport, all have combined to limit seriously the number of areas in which industries can be carried on successfully. These areas must have an abundance of labour, suitable—in cost and character—for the work; they must have access to free and immense supplies of capital for all sorts of purposes, especially machinery and marketing; and the labour supply and the capital "must"—or very nearly "must"—be in a climate favourable to mental and manual activity, and likely to produce a people with these favourable factors as their racial inheritance. These are the factors which should be kept in mind as we take a regional survey of some manufacturing areas of the New World.

Manufactures: Animal Products. Most animal products, especially meat and milk, are much more perishable than the great vegetable staples, especially the bread-stuffs; and the modern commerce in them depends fundamentally on refrigeration and facilities for transport by land and sea. Indeed, the isolation and independence of the old ranch are things of the past; and the meat industry of the U.S.A. is now directly associated with agriculture, as it was in the early days of colonization. Then, of course, cattle, sheep, and pigs were kept on every farm, and had an immediate local market; to-day, the great cattle and pig markets are all in, or on the margin of, the "Corn" Belt. Once transport and refrigeration were developed, the animals were slaughtered where they were raised or "finished," but consumed in the cities of the eastern States.

Meat. This led to all kinds of economies. The cattle and sheep could travel on their own feet from the dry West to the "Corn" Belt; both slaughtering and selling were centralized and divorced from serious seasonal fluctuations; inedible portions were converted into fertilizers, etc.; and, incidentally, the quality of the meat has improved, for young beasts fatten more economically than old ones. The same is more or less true of sheep, though the distribution differs from that of the cattle. The mass of the latter are raised in the western half of the Mississippi basin, between 85° and 105° W., but the mass of the sheep between 105° W. and the Pacific, and between 85° W. and the Atlantic; and the north-eastern quadrant of the U.S.A. and the contiguous part of Canada, especially Ohio and Michigan, have a thriving industry in the "finishing" of lambs.

Pigs are in rather a different position, for they cannot travel any distance, and so they are both raised and "finished" in the "Corn" Belt; and this is the main reason for the very poor quality and flavour of "American" hams and bacon, maize—unlike barley—making grease rather than fat. But the increased use of vegetable oils instead of lard may, and even must, ultimately, affect the "Corn" Belt farmers; and then they will have to alter their system of fattening in order to improve the quality of what will then be their main product, "meat."

All these geographical and economic considerations combined to favour the rise and concentration of the meat-packing industry in the "Corn" Belt, with its centre at the pivot most accessible by both land and water, i.e. Chicago. The largest subordinate centres are found slightly to westwards, in Kansas City and Omaha (cf. Fort Worth and East St. Louis); but eastwards there are more or less continuous centres, between 40° and 45° N., right up to the Atlantic.

Canada has no "Corn" Belt, and this helps to account for the superior quality of Canadian beef and bacon; but in Central Canada, especially in Alberta, we have to take into account the influence of a climate much more favourable to natural pasture than that of the comparable U.S.A. "plains." The buffaloes used to move *northward* in winter! Obviously, wherever there is a dairy industry, there must be some kind of a subordinate meat industry, if only for the production of veal; but the essential conditions of the meat and the dairy industries are quite distinct both geographically and economically. Dairy cows need succulent herbage, not concentrated foods, and hay, not grain; the soil should be retentive of moisture, but the surface should be sufficiently undulating to ensure drainage; summer temperatures should not be high, and the rainfall should be uniform without being violent. Of course, the hay can be replaced by silage; and the temperature of the dairies can be controlled artificially.

Milk. The milk problem is really as important as the bread problem, especially for children. Physiologists are agreed that the minimum essential of "milk fat" (vitamin A) per person is at least 40 grammes per day, i.e. a glassful of milk and an ounce of butter; and even in our own country, an almost ideal dairy region, our total supplies of home * and imported milk fat do not exceed a possible 30 grammes. As a considerable number of people consume more than 40 grammes, there must be a dreadfully large number not getting 20 grammes, or even 10 grammes. Margarine may replace butter *after* the consumption of the minimal 40 grammes, but *not before*—unless it has been properly "fertilized" by light.

When we turn to North America, we find that 50 per cent of U.S.A. milch cows and 70 per cent of Canadian are in the St. Lawrence basin and its southern flank, i.e. between 40° and 50° N.; and this percentage corresponds fairly well with the percentage of the population of the two countries that is concentrated in the same area, and milk is bulky and perishable. But the amount and the distribution of the rainfall, especially in summer, are at least as important as the number and the distribution of the people.

Directly we get away from areas of dense population, it is more profitable to convert milk into less perishable foods, especially butter and cheese—*not* into "condensed" form, because this is often very deficient in vitamin A. Both foods are easily handled, especially the (less perishable) cheese; but it is difficult to keep milk in perfect condition over long journeys in sparsely inhabited areas, where transport is not very good, and it must be in such condition to make good cheese. Cheese-making areas are, therefore, to the north of the dairy belt, especially between the Great Lakes and the Atlantic. Here is the secret of the supremacy of Ontario in the cheese market, its "lake" position being more favourable than that of its chief U.S.A. rival, Wisconsin.

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* In 1927 we had 15,280,000 acres of permanent pasture, and our yield of milk was 1,250,000,000 gallons. This was a decrease of some 100,000,000 gallons on the yield two or three years earlier, but there does not seem to have been a decrease in the past two or three years.

Hardware. The conditions have been even more favourable to the growth of a great iron and steel industry in North America than to that of a great cotton industry, and its late rise only accelerated its growth. For it had nothing to "scrap" in the way of ideas or plant, and started with the garnered experience of all Europe behind it. Europe itself saw something similar in the rapid rise of German industry after 1870, exploiting the results of the long experience of other nations; and just as the phenomenal growth can never be repeated in Germany, so it cannot be repeated in the U.S.A.

In the first place, North America is exceedingly rich in the necessary raw materials, both ore and fuel. It is far the richest continent in its stores of fuel, and these had scarcely been touched in 1870. Coal has been mined in England for 1900 years, and was actually used for smelting iron (in the Forest of Dean) 700 years ago; even in China it has been mined for 800 years. In North America it has not been mined much more than eighty years!

Power. While not very rich in anthracite (Eastern Pennsylvania and British Columbia), the continent has immense stores of bituminous coal and even larger stores of brown coal. Of course, this soft coal is inferior to the bituminous in heating, keeping, and travelling qualities; but, like small fields of bituminous coal scattered over the Cordilleran area, it is exceedingly useful for local purposes, including railways. The bituminous fields of the Appalachian area, especially in Pennsylvania, have an admirable commercial position, are very easy and safe to work, and contain some excellent coking coal, especially in the Connellsville district of Pennsylvania. The next largest fields (after the Appalachian), the "Illinois" and the "Missouri," are also easy of access; and the "Illinois" (Indiana, Kentucky) field produces good coal. Indeed, the State of Illinois alone raises nearly as much coal as West Virginia, i.e. nearly half as much as Pennsylvania, *excluding* the anthracite (fully 130,000,000 tons a year).

North America is also much the richest continent in petroleum, producing 85 per cent of the world's total, 65 per cent in the U.S.A.; and, again, Pennsylvania was the scene of the first wells. The leading states now are Oklahoma and California, Texas and Kansas, and the demand for oil in the U.S.A. can no longer be satisfied from the home wells; but in the early days the Appalachian field (with its high percentage of gasoline, light oil, paraffin) was another great asset, especially in Pennsylvania, also rich in natural gas (cf. Oklahoma).

Even in potential water-power, North America is richer than Europe, and the actual development is greater. At present only the most accessible and most easily worked sources are being used, especially in Ontario and Quebec, New York and California; the centre of the Ontario–New York system, Niagara, is again conveniently placed for the iron and steel industry of the north-eastern States.

Canada is greatly favoured. It has, of course, good coal in the Maritime Provinces, in the Rocky Mountains

Piedmont, and in Vancouver Island; and much of its prairie lignite (75 per cent of the whole) is of very good quality—almost bituminous. But its most densely peopled area, Ontario, is destitute of coal and lignite. It is precisely here, however, that geological structure, prehistoric glaciation, and normal precipitation combine to give, as in Quebec also, exceptional water-power, the capacity installed in these two provinces alone being nearly equal to 25 per cent of the total installed in the U.S.A. As the Laurentian shield, especially in ✓Ontario, is exceedingly rich in metal, the wide distribution of this water-power is likely to be of first-rate importance; already Ontario is responsible for fully 50 per cent, and Quebec for fully 25 per cent, of the total manufacturing output of Canada.

Ore.✓The provision of iron-ore is as lavish as that of coal, and there is no lack of limestone or of any other necessaries for the manufacture of steel except the alloys. The quantity of the latter used, even in the U.S.A., is, of course, relatively tiny, though their importance is very great, but the quantity of the three essentials—coke, ore, and limestone—is immense. As it is very easy to get the limestone, the problem is whether to carry the ore to the coke or the coke to the ore.

The chief source of good coke is in Western Pennsylvannia, while the chief source of cheap ore is in Eastern Minnesota, with 1,000 miles of navigable lake, river, and canal between the two; and the boats which carry ore eastward, had far better carry coke or coal westward than go back in ballast. There is a wealth of ore also in Michigan and of coal in Eastern Ohio, and there is a dense population to the south of Lake Michigan and to the south of Lake Erie; and the most convenient places for ore and fuel to meet where there is easy access to limestone, are on or near the south shores of the two lakes—e.g. Cleveland and Pittsburgh, Gary and Chicago.

About 80 per cent of all the iron mined in North America comes from these mines round Lake Superior, especially from the Mesabi range, where it is very abundant, mined with great ease, and containing a high proportion of metal. The single place where all the three essentials are found in the greatest quantities side by side, is the Birmingham valley in Alabama. The richest reserves that have not yet been seriously touched are in Newfoundland. In the meantime, Alabama does not produce half as much ore as Michigan, nor Michigan half as much as Minnesota; but Pennsylvania is far the largest producer of pig-iron, followed by Ohio, and even New York produces more than Alabama, Illinois and Michigan producing rather more than New York, but not half as much as Ohio (as a rule nearly 9,000,000 tons per annum).

With cheap ore, cheap fuel, and cheap transport between the two, we have the three "essentials" for a great steel industry. What about the other three favourable "accidents"? Cheap labour was most easily secured near the great immigrant ports, and so the immediate hinterland of New York was again specially favoured; then the variety and the magnitude of steel products have made huge plant necessary to economic production, and the older states had more accumulation of capital; and the vast capital made it possible to eliminate the middleman, so that the U.S.A. Steel Corporation owns coal and iron mines, limestone and gannister quarries, coke ovens and smelting furnaces, even railways and steamers.

These conditions have made North America supreme in the production of steel. Even before the war, Germany had never produced 20,000,000 tons of either pig-iron or steel, while the U.S.A. alone has produced over 40,000,000 tons of pig-iron (1923) and over 45,000,000 tons of steel (1925). The world's present capacity for producing steel is put at about 120,000,000 tons (1929), and the capacity of the U.S.A. alone is fully 55,000,000; 35 per cent of the world's ore is produced in the U.S.A. (85 per cent of that being from the Lake Superior mines), and 25 per cent in Lorraine.

Specialization inside the industry was more or less bound to be regional, for natural occupations are largely a response to regional controls. Thus, the making of agricultural machinery was, shipbuilding was not, likely to be associated with the prairies; in the days of wooden ships, the great building yards were likely to be found on the New England coast; with the change of material to iron and then steel, the centres were likely to be found on the seaward flank of the great coalfield; on the landward flank, where the great waterway between ore and fuel swung nearest to the north-eastern corner of the continental lowland, Detroit was an ideal place for the manufacture of such a medium of inland transport as motors.

There is always, too, in old centres the possible question of geographical momentum, i.e. the persistence of an industry in its original home In the early days, Boston and Philadelphia were more favoured than New York, the one as nearer Europe and the other as far up a great river. New York, at the mouth of a smaller waterway, was found eventually to have better access to the continental interior than either of its predecessors; but in the days of their supremacy no one wanted to get to that interior. Philadelphia had the further advantage of being on the seaward edge of the anthracite coalfield; and anthracite was used for smelting in

Eastern Pennsylvania long before coke was used in Western Pennsylvania.

No other continent except Europe seems likely to be of any importance in the iron and steel market, and Europe cannot compete with North America.

Cotton Textiles. In many ways conditions have been even more favourable to the cotton industry. In spite of the ravages of the boll-weevil in those areas where the winters are not "cold," and the spring is not "dry," the U.S.A. still produce about three-fifths ($\frac{15}{28}$) of the world's supply of raw cotton, mainly on the "black wax" of Texas, the loess and alluvium of the Lower Mississippi bluffs and bottoms, and the light loams of the coast plain and the heavy loams of the Piedmont plateau in North and South Carolina and Georgia. The greatest acreage is in the drier west, but the heaviest yields are in the damper east, where the climate is quite suited to cheap negro labour and to mechanical ease in spinning and weaving. Indeed, since the beginning of this century the southern mills have been consuming actually more cotton than the northern, but, of course, they are doing coarser work. Indeed, everywhere in the U.S.A. the climate is far less suitable for fine work than in England, especially in Lancashire; and Liverpool is still the great cotton exchange of the world.

Both in the north and in the south, water-power is abundant, but both have outgrown the supplies; and more than half the mills now in the north and nearly half in the south depend on coal, with which the south is cheaply supplied from the Alabama coalfield. The north, however, needs relatively less raw cotton for its fine fabrics; and it has more capital, better labour, and easier access to the largest markets. The difference in the quality of the northern and southern yarns is far greater than that between e.g. Bolton and Oldham yarns, the annual rationing of a Georgian spindle (over 140 lb.) being more than double that of a Massachusetts spindle. And access to water-borne coal, e.g. at New Bedford and Fall River (with its significant name), is more important than access to water-power, e.g. at Lowell and Manchester. Cheap labour near the immigrant ports and access to cotton stuffs have located a group of dependent industries behind New York and Philadelphia, e.g. collars, etc., at Troy.

Wool. Originally, nearly all the wool in North America was "fine," and fine-woolled sheep (largely merino) are still the typical animals on the arid plateaus of the Cordilleras. But the English coarse-woolled sheep produce 100 per cent more wool, and merino mutton is uneatable; long and cross-bred wools are, therefore, associated with the "lamb and mutton" areas, and about seven-tenths of the 50,000,000 sheep in the U.S.A. are west, while about ten-thirteenths of the 3,750,000 Canadian sheep are east, of 95° W.

The quantity of wool sheared in Canada is about sufficient for the Canadian woollen industry; but the U.S.A. cannot supply more than about half its own needs, and has to import large quantities of both clothing and carpet wools, especially the former, from South America (over 50 per cent), South Africa (10 per cent), and Australasia (10 per cent). And thus there was bound to be a tendency to concentrate the woollen industry in the importing harbours, ignoring the old factors of location, i.e. the home supply, an immediate market and a source of power (generally water-power).

Further, the demand for constant variety of goods, especially worsteds, could be met only by large mills with expensive plant and highly-skilled labour; and thus control of the industry passed into the hands of the great textile magnates of the New England and neighbouring States. To-day, Boston is the chief wool market in America, and 90 per cent of the wool industry of the U.S.A. is concentrated in that north-eastern corner of the republic. Massachusetts produces about one-third of the total, and Pennsylvania and Rhode Island together produce about as much as Massachusetts—Lawrence, Philadelphia, and Providence being the three great centres.

Another consideration was of importance. The mass of the immigrants entered through the north-east ports, especially New York, and created an immense demand for ready-made clothing; and to meet this demand the same cities, especially New York, had an abundant supply of cheap labour, especially Slav immigrants, and exceptional advantages for marketing. New York thus became far the most important centre of this industry, though Boston and Philadelphia, and even Baltimore and Chicago, are also important.

Leather. The tanning of leather, like the working of wool, was a home industry in all the early colonies, all of which were located in the forested margins of the continent, where there was an unlimited supply of oak or hemlock, or both, providing all the materials then needed for tanning; and for all the leather there was an immediate market amongst the local saddlers and shoemakers.

But hides (i.e. large) and skins (i.e. small) are almost imperishable and easily transported, and steady clearing of the forests soon diminished local supplies of bark; and the classification of the different kinds of pelts improved along with improvement in the means of transport. A tendency, therefore, sprang up to localize and concentrate the work where it was most easy to collect all the materials needed; and nearness to markets began to seem more important than nearness to the source of the (easily and cheaply transported) hides and skins. And so the great leather centres are found to-day in the most densely peopled areas of (1) the oak and chestnut belt, and (2) the hemlock belt of the Atlantic hinterland, i.e. especially in Pennsylvania.

Two other influences should be noticed. On the one hand, the old tanyard, with its weird aromas, is a thing of the past; instead of multitudinous loads of bark, we have relatively small and compact parcels of extracts and chemicals, with an immense saving in transport —if with an *inferior* quality of leather—and a greatly widened source of supply (Rhodesian chrome, Argentine quebracho, Natal wattle, etc.). The other influence is also connected with the transport facilities; for the home supply of hides and skins is not nearly large enough to meet the demand, and more than half the total is now imported, mainly from South America (cattle), Europe (sheep), and Asia (goats). Here, again, as with the wool industry, the ports have special opportunities for developing an industry; but, as the home supply in U.S.A. still comes largely from the Chicago basin, "landward" ports, such as Philadelphia, are almost as well placed as "seaward" ones, such as Boston (cf. Quebec). Brockton, Lyons, Haverhill, and other boot and shoe centres form a ring round Boston.

CHAPTER XVII

NORTH AMERICA (3)

BEHIND much of what we have been trying to emphasize, lie the obvious truths that some places are more suited than others for the production of certain commodities, and that each place should produce what it is best suited to produce; then the particular product should be abundant, cheap, and of fine quality.

But the moment this local or regional specialization ✓ comes in, we are faced with the problem of transport; ✓ and North America is the continent in which, perhaps, we can study this problem most easily. It is a relatively "young" area in the history of civilized man; it contains two very large areas, both of them single political units, both developed by the vigorous White man, both free alike from internal tariff barriers, from strategic need for change of railway gauge, and from other political complications such as have affected the history of transport in Europe.

Inland Transport: Water. In the early days of colonization settlement was coastal, and there was no real attempt to penetrate the interior of the continent for permanent settlement; access inland was possible by rivers and by Indian "trails," and the Red men made constant use of both. The trails were, of course, fairly well suited to pack-horses, but the mass of all the early transport was by river; and the early opening-up of the interior was closely associated with the St. Lawrence, the Ohio, and the Mississippi, the Ohio being in some ways the most important because it flows—for nearly 1,000 miles—*westward*, i.e. in the direction of the great historic expansion from the Atlantic coast.

To a period of river transport (reorganized partially during the late war) there succeeded one of canal development, most of the canals being short links between the natural waterways; and it was obviously natural that there should be special efforts made to link the two great east-and-west waterways, the Ohio and the Great Lakes, to each other and to the Atlantic. The one effort which has survived, with various changes of form, is the famous Erie Canal—along the only really favourable route, and therefore through the earliest settled and most densely peopled region (cf. the Aire and Calder canal in England).

All the others have disappeared or sunk into insignificance, because—with some obvious exceptions, which are *exceptional* in their geographical conditions—inland water transport cannot compete with railways. It is perfectly obvious that, before the development of railways, rivers in North America, as in Europe, were of immense value as means of transport; and the St. Lawrence waterway, especially in the upper "lake" basin, is so still. But the Great Lakes are in the nature of an inland sea, with a total area (*c.* 100,000 square miles) two-thirds that of the Black Sea or the Caspian.

There is such a bewildering amount of misconception and prejudice everywhere, fostered by interested propagandists, about this problem of inland water transport that it may be worth while paying some detailed attention to it. We must first distinguish between sea and land transport, and then we ought to distinguish between those inland waterways which are natural, and those which are artificial. The main reason why sea transport is so much cheaper than land transport is that we have to spend nothing on providing and maintaining the medium; and this is true to some extent of large rivers. But it is obviously not true about canals.

The nationalization and reconstruction of our English canals have been strongly supported by statistics drawn from continental Europe. Even a paper of the high standing of the old *Daily Chronicle* pointed out that, on the evidence of the canal traffic between Hamburg and Berlin, the Aire and Calder Canal could be made fit for all probable traffic at a cost—before the War—of £100,000 per 10 miles.

Even if that were true, we must remember that the ? Aire and Calder follows the most level route followed by any canal in England, that it is in one of the wettest parts of England, and that it is the cheapest of all to work—owing partly to its easy access to coal and the industrialization of the locality. We, therefore, cannot argue from it to any other canal; we must insist that, while there are only three locks in the 230 *miles* between Hamburg and Berlin, the average in England is three in every 3,600 *yards*. Quite apart, too, from the cost of making and operating these locks, there is the vast amount of water needed. Already the demand for water for ordinary town-supply is a very serious problem; and where canals would be most used, i.e. in the Midlands, the water supply (including the local rainfall) is not sufficient to feed the present canals properly, still less to feed an enlarged and improved system. In many "mined" areas the canals could not safely be deepened, and to widen them in densely peopled areas would be far too costly.

Even on the Continent it is recognized that only two types of canal can be justified even apart from cost. The one is the link between two navigable rivers, or between two lengths of navigable water on the same river, e.g. the canals already constructed round the half-dozen rapids on the Upper St. Lawrence or the proposed Georgian Bay canal; the other is the "ship" canal, which is really only the extension of a seaport farther inland. When the *total* cost is faced, even these canals cannot compete with their rival railways.

Almost nothing can be urged for the proposal to construct an Oswego-Hudson canal, not even if the western terminus is really meant to be at Buffalo. The complete failure of the Erie Barge canal, even in its improved form, cannot be made an argument against a ship canal; but the cost of scrapping the old waterway would be a serious burden on the cost of the new one, and the total amount spent on it is already greater than the original cost of the Suez Canal. Of course, New York owed its rise as a port to the canal, but now 95 per cent of the traffic between Buffalo and New York is done by rail; and the available water supply, so far from encouraging "power" development, would probably not be sufficient to *guarantee* navigation—at least on the summit levels—for a ship canal.

For the all-Canadian route via the Ottawa valley to Georgian Bay a great deal can be said, and the objections raised against it are largely fictitious and propagandist—the cost, the difficulties of navigation, and the alleged improbability of making any sufficient saving in time.

The total length of the "canal" would be about 450 miles, i.e. 200 miles more than the Buffalo–New York route and 300 more than the Oswego route; but, while both the U.S.A. routes would involve an immense proportion of excavation, the Canadian route has ? already a natural waterway—via four lakes (Talon, Turtle, Trent, and Nipissing) and four rivers (Ottawa, Buck, Mattawa, and French) for more than 330 out of the 450 miles. Moreover, this natural waterway is *at least* 100 yards wide and *at least* 22 feet deep; and to lower this to 25 feet and to provide 23 locks of the same depth (850 ft. long × 65 ft. wide) would be easy and relatively inexpensive.

This is not all. The actual excavation needed does not exceed 30 miles; the amount of dredging needed covers only about 65 miles; and the saving over the all-U.S.A. route between Liverpool and Winnipeg would be fully 800 miles.

This route then, is not only all-Canadian and much the shortest, but also—for the actual work to be done and the results to be obtained—much the cheapest; there would be no more difficulty about navigation than by either of the other, more southerly, routes, except possibly a few days more of frozen water; and the staple freight (wheat, iron ore, coal, and wood) is not in any case such as needs express speed. Moreover, it is the only route which would not seriously injure Montreal.

Now we may speak of rivers and canals together in some respects, especially with reference to North America. Canals can go rather straighter than rivers, but both "meander"; in the important part of the continent, S.E. Canada and N.E. United States, both are closed by ice for three to five months; and to both much of the traffic has to be brought by rail! The most costly element in transport is transhipment, and such cost *must* be added to the "nominal" cost of simply carrying the goods on the canal. In canals there is, or ought to be, and can be—at a price—a uniform depth; but this cannot be guaranteed on many rivers. Indeed, even the Ohio varies 40 *feet* every year.

When we consider, then, the volume, the speed, the certainty, the flexibility of the traffic (every warehouse can have its railway siding), the *true* cost, all alike justify the assertion that inland transport cannot normally compete with rail; and any exceptions are (1) on such a "deep" water route as the Great Lakes, and (2) where some river or canal has a constant mass of heavy and bulky freight which must travel very cheaply, e.g. coal or stone. Even so, "cheaply" means only the paying of no tolls or very low tolls; *the real cost to the state or nation is ignored.*

The Great Lakes, or Laurentian Sea, must be counted as the supreme "deep" water route, carrying more than twice what is carried by the Suez and the Panama Canals together; the route lies exactly on the line of maximum movement—east and west, between ore and fuel, between food and population. The trade is also highly specialized—ore, coal, grain, with boats, machinery, methods, all highly specialized to suit it, and with tremendous hauls (often 1,000 miles). With a minimum amount of handling and a maximum speed (50 tons of coal loaded in *one minute*), the cost of freight per ton is negligible; but, of course, in winter all the traffic *must* go to the railways.

Even in the northern region, where the water facilities are almost unique, they depend largely on railway co-operation; but the question of the mobility of the medium is important and intricate. If it costs a halfpenny per ton per mile to move wheat by rail from Winnipeg to the Atlantic seaboard, and the water rate is usually less than a farthing per ton, it is fairly certain that much less wheat would be moved by rail if only the water rate was always open. At the same time more than half the wheat moved by water comes down in the last eleven weeks of the season, when considerations of time and of lower rates for freight and insurance divert traffic at Buffalo to rail for New York. Even

Canadian cargoes are diverted in this way to New York, partly because of the high insurance rates, but partly also because of the small volume of spot cargo to attract "tramp" steamers. During the other seasons the canals are worked far below their capacity, while in the rush the water route is relatively immobile. This is one reason for the prairie farmers being so much interested in the Hudson Bay route; it also throws light on the attitude of New York and Philadelphia, Buffalo and Albany, to the whole scheme.

Rail. In the early days, railways played very much the same part as ought to be played now by these "link canals" to which we have just alluded, for they were more or less links between natural waterways; and they were, therefore, numerous but incoherent, e.g. six little lines feeding Boston, four apiece feeding New York and Baltimore, and three feeding Philadelphia. In Canada, the St. Lawrence and its Laurentian tributaries remained supreme, because they were the essential keys to the timber and the fur trades. Even now the timber and wood industry employs more hands than any other Canadian industry, though the value of the food products is more than twice as high as that of the wood and timber.

Again, the geographical momentum, to which we have also been alluding, would help to maintain trade movements along the lines already adopted, which were water lines, mainly the St. Lawrence and the Mississippi, but also the Hudson and the Golden Gate; and so the water terminals attracted the railways. Eventually the two great "Atlantic" routes, the St. Lawrence and the Hudson, developed the greatest ports and railway junctions on the continent, Montreal and New York, and the "Pacific" routes developed somewhat similar, but smaller, centres behind the

Golden Gate and the Juan de Fuca Strait. San Francisco monopolizes attention in the one case, while Vancouver and Seattle share it in the other.

Colonization moved essentially westward, but the Pacific coast (as well as the Atlantic coast) was known long before the interior; and, therefore, transcontinental railways were an early necessity, and the natural east-and-west routes, especially the St. Lawrence, the Mohawk, and the Ohio valleys, were of prime importance. If we add that Montreal, though in the longitude of New York, is 1,000 miles up the river and yet 300 miles *nearer* to England, and that Vancouver has similar superiority over San Francisco with regard to Japan, we almost imply that the one great transcontinental railway was bound to be the Canadian Pacific (C.P.R.); but there was a question of relief behind it, as well as one of the narrowing of the degree of longitude in the more northerly latitude.

A glance at a relief map will show that between 35° and 45° N. the Cordilleran system maintains a steady width of fully 1,000 miles—roughly from 105° to 125° W., but narrows rapidly to 500 miles to the south, and even less than 500 miles to the north, of those latitudes. That is to say, it is a much more serious obstacle in the U.S.A. than in Canada or Mexico. The superiority of Canada is altitudinal as well as longitudinal. The "Kicking Horse" Pass (5,300 ft.) is much the highest of the three great Canadian passes, but the C.P.R. summit there is nearly 300 ft. lower than that on the Northern Pacific line in the U.S.A. and nearly 3,000 ft. lower than that on the Union Pacific. Yet the "Kicking Horse" is 900 ft. higher than the Crow's Nest and 1,600 ft. higher than the Yellowhead.

Of the U.S.A. lines, the New York Central, like the Erie Canal, follows the "line of least resistance" in the

Mohawk valley, with a summit of only some 400 ft.; all the other great eastern lines have to climb the Appalachian scarp at an average height of 2,000 ft., the Pennsylvania line associated specially with the Upper Ohio river, the Baltimore line with the Potomac, and the Chesapeake with the James. Chicago is the pivot of the Mississippi lines, e.g. to Sante Fé, New Orleans, etc., the northern systems being specially associated with Puget Sound. But these northern lines, like the southern, though actually along easier routes, were constructed later than the Union Pacific—because of the historic attraction of the *central* route via the Platte valley and the Salt Lake basin, the Cheyenne and the Yuba passes.

The St. Lawrence valley is so narrow for its length, and the original belt of population across the prairies (to the Pacific) was also so narrow, that the problems confronting the builders of the C.P.R. were relatively few and relatively simple; and, although over 50 per cent of the Canadian railways is now combined in the Government system, the National Railways, the C.P.R. remains as the best line in the New World. No one ever thinks that C.P.R. means the *Central* Pacific Railway.

In the U.S.A., the problems have been more numerous and more complicated except for the N.Y.C., partly because in Canada there is nothing comparable with the great natural *north-and-south route* of the Mississippi valley. This has actually led to the U.S.A. being divided into three railway regions, two of them to the east and the third to the west of the river. Of course, the western region is very much larger than both the others together, and has to cope with immense distances—often in very thinly peopled areas; and so it has more miles of track than both the others together—with only 40 per cent of the traffic.

The northern region is the smallest of the three, its southern boundary being roughly marked by the Ohio and the Potomac; but, of course, this includes far the most densely peopled area of the U.S.A.—most densely peopled just because of (1) the wealth of coal and all the huge industrial development associated with that, and (2) the very large movement of prairie products eastward to the ports of the Pivot-Gap, especially New York. This group of lines, therefore, with only about 25 per cent of the total mileage, handles nearly 50 per cent of the total traffic. The southern group has access to Chicago between the northern and the western groups, and it has very few climatic troubles to face; but it is relatively unimportant, partly because of the number of navigable and unfrozen rivers in the most thickly peopled and most productive parts of the region.

As in the case of English *versus* German canals, so in the case of British *versus* U.S.A. railways, many of the comparisons made are very misleading, because they entirely ignore the fundamental geographical background. For instance, in "new" or comparatively "new" countries, such as the U.S.A., land for railways has generally cost little, or even nothing, and extensive areas along both sides of the actual route have been "thrown in"; then, in a large area of relatively simple relief, the cost for bridges and tunnels is relatively small; and in a more or less "unsettled" area the supply of stations, signals, etc., may be relatively primitive. On the contrary, in a large area producing raw materials in bulk, freight often travels long distances in huge quantities, e.g. a haul of 1,000 miles in the U.S.A. roughly corresponding to one of 100 miles in England. Indeed, the average haul in the U.S.A. works out nearly 100 miles longer than the average haul in England; and in England, too, but not in the U.S.A., the rate will include collection and delivery.

According to the figures reported in the *Bulletin of the International Railway Congress*, the average cost of construction per mile in various countries has been: British Isles, *c.* £54,000; France, *c.* £25,000; Germany, *c.* £21,000; but U.S.A., *c.* £12,500; Canada, *c.* £12,000; Argentina, *c.* £11,000. It is against these figures that we must compare fares and rates in the different countries. In the case of the U.S.A., we must also remember that, literally, enormous weights of minerals and agricultural products must have an average haul of 125 miles, e.g. 500,000,000 tons of coal! Here, then, is a total mileage of 240,000, with a construction cost of only £12,500 a mile and a harvest of 400,000,000,000,000 ton-miles per annum. Criticism about size of truck or cost of handling should first face these figures. Who really comprehends what 400,000,000,000,000 tons means?

Quite apart from the questions of the quality and the scope of the service, these figures show the absurdity of comparing our British railways with the State lines of continental Europe or the private lines of North America; but the latter, especially in the U.S.A., have had several incidental advantages, which throw light on the history of the great trunk lines.

To start with, the area occupied by the U.S.A. never had a comprehensive road system, not even in its north-eastern quadrant; and its so-called turnpike net came into existence only in the first quarter of the nineteenth century. The earliest real road in the country was built westward from Philadelphia, and it was not opened till 1794; and the first National, i.e. Federal, road was not begun till 1811. Even then the fundamental motive was political, not economic—unity, not trade.

The very year that saw the opening of this national road, saw also the beginning of the Erie Canal, which in itself suggests how greatly public opinion was occupied by the importance of water transport. The rivers, especially the Ohio, had been the great highways; roads could not compete with them in the development of the region; the main need was for links between these natural waterways, and the canal was an artificial river put exactly where it was wanted.

Then, while river traffic was actually at its height on the Mississippi, it was paralysed by the Civil War —between North and South, i.e. the Upper and the Lower Mississippi latitudes; and by the time that the war was over, railways had seized the opportunity, and demonstrated once for all that the lines of maximum movement in North America must run east-and-west. This meant the ruin of the Mississippi and the success of the St. Lawrence and of rail. In 1850 the total length of rail was under 10,000 miles; in 1870 it was over 50,000; by 1890 it was far above 150,000; and to-day it is above 260,000.

Further progress will be relatively slow, for at last the country is beginning to think of a proper network of roads for its 20,000,000 motor vehicles. At the same time the motor traffic is not likely to do much injury to what has always been the basis of railway prosperity in the U.S.A.—the carrying of huge loads of foodstuffs and minerals in bulk for immense distances. In the meantime there is only *one mile of road* for every 50 square miles of area.

CHAPTER XVIII

SOUTH AMERICA

ALMOST any part of the world may illustrate all the fundamental principles and processes of geography—the relation of structure to relief, of relief to climate, of all these to natural vegetation, etc. But the aim of this survey is to be suggestive rather than comprehensive, to encourage an attitude of mind rather than to supply a body of knowledge. We, therefore, may, and even must, select.

Our first selection in this chapter may be one dealing with what is an acknowledged danger, i.e. practically monoculture. Rotation of crops is an old custom in Britain, and its importance was driven home by the potato famine in Ireland; but we must try to think clearly on the subject. It is perfectly true and obvious that, if the same crop is grown on the same land year after year without any precautions, the harvest will grow less and less, the crop will become more and more liable to disease, and eventually the soil will become unable to produce the particular crop, because the minerals needed by it will have been all exhausted.

It is equally true and obvious that rotation may help the mechanical work of a farm, distributing hand, horse, and machine labour more evenly over the year than, e.g. if every year spring-wheat is grown. It also gives opportunity for getting rid of weeds, e.g. by the hoeing of root crops; and some root crops, especially potatoes, involve deep turning up of the soil during "harvest."

At the same time, we know nowadays more or less exactly what our various soils are like, and what our various crops require in the soil; we can make good almost any defects, physical or chemical; and we can fight with fair success the various pests, animal and vegetable. The one thing against which we are more or less powerless is climate. It may, therefore, be wise, especially in Britain, to grow, e.g. wheat, year after year in the parts of the country that have the most suitable climate, i.e. on the same soil—limiting our wheat to such areas and making good the exhaustion of the soil. This is certainly the best way of using the parts of England that are most suited to wheat.

Cuba. Now, sugar occupies in Cuba somewhat the same relative position as the potato occupied in Ireland before the famine, or as the currant holds in Greece, or coffee in southern Brazil. The island certainly grows very good "Havana" tobacco, some of the best in the world for "filling" and "wrapping" cigars; but scarcely 15 per cent of its exports (in value) consists of tobacco. It also grows good fruit, especially pineapples and bananas, which are also conspicuous in the short list of exports. But even the tobacco, though very famous and grown directly for export, is relatively unimportant; and, with the decrease of cigar-smoking and the competition of the Porto Rico tobacco (duty-free in U.S.A.!), it is likely to become even less important than it is now.

The one crop is cane-sugar, the greatest carbohydrate crop (with a calories value nearly six times that of potatoes), the only prime foodstuff at present exported from the Tropics in immense quantities. With a total area less than that of England (without Wales) Cuba is the most important producer of sugar in the world, producing not far from a quarter of the whole world's commercial supply.

Most of the area is a fertile lowland of porous limestone, on which a number of crops would flourish, e.g. tobacco and maize; but there is one very important "cash" crop for which the climate, like the soil, is ideally suited, i.e. cane-sugar. An island in a very warm sea is bound to have even temperature, as a hilly island is to have abundant rainfall, especially if—as in Cuba—no part of it is more than 60 miles from the sea; being just inside the Tropics, Cuba has no extreme summers, and yet must have warm winters, the mean range at Havana being only 12° F.

But it is the rainfall that has been so favourable to the sugar and so unfavourable to rival crops. The mean is well above 50 inches, and over 65 per cent falls in the five summer months, while less than 12 inches falls in the five winter months. In other words, the wet season is too wet, or the dry season is too dry, for rival "cash" crops. And, as Cuba is so near the largest buyer of sugar in the world, the U.S.A., and has a preferential tariff there, so much land is devoted (? sacrificed) to sugar that the little population of 3,300,000 cannot provide itself with food, and has to import food every year—sometimes to the value of over £20,000,000!

Western South America. The standard of civilization here is distinctly high, especially in Peru and Chile, partly because of the favourable climate. Even on the Peru coast the presence of the cold Humboldt Current greatly modifies both temperature and rainfall, and the climate of much of the Andean plateau is very healthy, while Central Chile enjoys a type of Mediterranean climate. Indeed, the only serious drawbacks here have been the distance from Europe (London to Lima *via* Cape Horn = 10,000 miles) and the absence of good harbours, the nearness of the Andes to the

Pacific being equally detrimental to the formation of natural harbours and to easy access inland.

Historically, this area was for ages the great source of gold and silver, both of them monopolized by Spain; and to-day it is an important source of copper (Peru and Chile), tin (Bolivia), and nitrates (Chile). The irrigated lowlands of Peru (apparently rich in petroleum) raise fine cotton; the Ecuador jungle is the natural home of very fine cacao; and the Andean plateau raises fine wool—from alpaca, llama, and sheep.

The favourable climate, the possession of coal and water-power, and the relative nearness to Europe gave Chile special advantages; and it ranks next to Argentina and Brazil amongst South American countries. The people are largely White, and the native element comes from the fine Araucanian stock; but the Panama Canal has increased the commercial advantages of its more northerly neighbours and rivals.

Argentina. As a whole, the continent drains and faces eastward—to the Old World, and this eastward drainage has favourable relief as well as easy access otherwise to the ocean. Its most favoured part, however, is not that nearest Europe and North America, but that in the more temperate latitudes to the south. Here, too, relief and soil have been peculiarly favourable, though the land is too young to have much mineral wealth. As the population has been very largely White, more or less full use has been made of most of these advantages; and Argentina has made, and is making, more rapid progress than any of its neighbours. Indeed, Buenos Ayres is the largest city in the Southern Hemisphere. The absence of mineral wealth and some lack of variety in its non-mineral resources may slacken its progress presently, especially as compared with Brazil; but its pastoral and agricultural importance at present is enormous, partly because it is one of the few countries with temperate climate in which vast grain-lands actually reach the sea. At the same time its deltaic origin and the vast subterranean drainage from the Andes give it such supplies of subsoil water that alfalfa can be grown in almost the driest parts, and windmills can almost everywhere raise drinking water for animals from quite shallow wells. The result is that the country absolutely dominates the beef market of the world, and rears probably 40,000,000 sheep for wool and mutton, the export of wool in 1930 reaching 144,000 tons. It is also one of the chief exporters of wheat, maize, and linseed.

The development has been much helped by a magnificent river system and the best railway system on the continent; but there is little or no prospect of industrial development apart from industries closely associated with the main "farm" products, e.g. dairy, meat, and flour industries.

Brazil. Brazil has one of the finest positions in the world for commercial development, but has made little use of it hitherto. In the days before steam Cape San Roque overlooked one of the busiest "junctions" in the whole Atlantic, and to-day Rio de Janeiro is almost equally important for both liners and tramp steamers.

The country is also very large, three times the size of Argentina, larger than the U.S.A. or Australia, and nearly as large as Canada; and it has considerable variety of structure, relief, and climate, and therefore of resources. Indeed, with regard to what are considered "necessaries of life" to-day, it is almost self-sufficient—a possible check on economic development.

Of course, half the area is alluvial swamp smothered in selvas (jungle), and the natural products of this are either unable to compete with similar artificial products of plantations elsewhere, e.g. Malay rubber and Gold Coast cacao, or are hard to find and costly to transport, e.g. ebony and rosewood. But there is an old highland which reaches its greatest height close to the sea in the most temperate latitudes, and height and latitude combine to make it very healthy and to give a perfect environment for coffee on its wet seaward slope, while its dry landward slope provides magnificent savannas for cattle.

The better climate, especially a bracing "winter," has favoured a fairly energetic population on this coffee highland; and coffee has been the main source of Brazilian commercial prosperity for generations. For it thrives best on forested hills on the margin of the Tropics, where frost is almost unknown, but weeds do not grow with jungle luxuriance and rapidity, and there are both a red volcanic soil rich in iron and potash and a dry season for the harvesting of the crop. When all these conditions are combined with easy access to the ocean (at Santos and Rio), coffee-growing ought to be a great success; and Brazil still supplies 70 per cent of the world demand for coffee. But the dependence on the crop has been too great; and, with the growth of competition, much of the São Paulo coffee-land is now being put under cotton, which yields a fibre of fine quality.

Naturally, with such a huge area of alluvium, mineral wealth is strictly localized on the old highland, i.e. where the best railways cannot provide transport that can rival—in cheapness—that on the thousands of miles of navigation on the Amazon system; and the diamonds which were once so profitable, because so easy to transport, cannot compete with the South African organization. There are immense resources of very fine iron, but the highland is too old to contain coal, and the iron-fields are at least 350 miles away from the ocean.

There are accessible deposits of valuable minerals, e.g. monazite and manganese; but these, though very important, are not needed anywhere, not even in the U.S.A. steel industry, in *large* quantities.

The fact that the country is so largely self-sufficient (cf. p. 154) throws some light on the relative importance of manufactures. But these, though more important than in any other South American country, are of only local importance; they do not include many articles, and they are mainly found in the "temperate" south-east, especially in São Paulo and Rio de Janeiro, the two great railway centres.

CHAPTER XIX

AFRICA

AFRICA illustrates on a gigantic scale one or two of the most interesting geographical problems, especially associated with landforms and world position.

Every plateau or tableland, by structure and relief, tends to be subject to drought. As it stands up above the surrounding levels, and is often composed of old, hard rock or rock arranged in horizontal strata, water runs off or runs through very quickly; and its steep scarp tends to drain any wet wind of its moisture, while the monotony of surface relief presents few features to encourage precipitation out of any wet wind which may have reached the interior.

Then, every area that lies along a tropic must be subject to the persistence of high pressure, i.e. dry, heavy air; and so one must expect to find great stretches of real desert where a tropic runs through a broad continent. In this case both the tropics run through Africa, and so the proportion of desert and semi-desert must be very great, especially as the whole continent is essentially a vast expanse of plateau.

The only redeeming features are (1) that the plateau is highest where it is narrowest, and so there is enough rain for very wide stretches of savanna, and (2) that the conditions over the Sahara encourage the inflow of monsoons in summer, and these feed the Niger and the Nile, and even give rise to a strip of wet-jungle (rich in oil-palm, cacao, and mahogany) along the Guinea coast.

There is also wet jungle in the strictly equatorial latitudes of the Congo basin, but only to a relatively small extent; for the altitude is much higher than on the Guinea coast or in the Amazon selvas. Plantation rubber is being grown here, but the difficulties of climbing the scarp of the plateau—necessarily by rail—make transport very costly.

What is the natural economic destiny of tropical plateau of this kind? At the best its cover is savanna; if the rock is very old, its contents should include rich deposits of metal. But savanna is the natural home of grass-eating animals, and one important cereal (maize) is a native of tropical plateau. We should, therefore, expect to find here Man essentially a herder of cattle and an eater of "mealies"; and he would probably be cut off by land from Man in temperate latitudes to the north or the south by a belt of desert, and be easily reached only by sea from the west or the east.

Transport. This throws some light on the early importance of the Guinea and the Zanzibar coasts. The latter had, of course, the unfailing alternation of S.W. Monsoon and N.E. Trade between Zanzibar and Calicut or Goa (cf. the name De-la-Goa); but the Guinea coast was much nearer Europe, had a more productive rainfall, and had reared the only real sailors in Africa—the Krus. Though access to the plateau must always have been and—except for aeroplanes—must always be very difficult, yet, once the surface of the plateau was reached, the monotonous relief was very favourable to transport, e.g. by ox-wagon, and it is still more favourable to railway development; and this in turn has helped the rapid spread of European influence over the whole continent, including even the Sahara.

Further, in such a continent the "temporary" or "exhaustible" wealth, to be of maximum use, should combine great value with small bulk, e.g. diamonds and gold; and the latter especially is a means to, as well as a motive for, the construction of railways, by which the rest of the resources of the area can be opened up. In this particular case, too, the real heart of the habitable continent is occupied by the Katanga mineral-field (copper, tin, cobalt, coal, radium, etc.), one of the richest fields on the face of the earth. Even where climate and vegetation have been less favourable to land transport, as in the Congo basin, there have been waterways of great regional importance.

Raw Materials. It would be absurd to expect the same kind or degree of economic development in Central Africa as in the temperate latitudes of the extreme north and the extreme south; and even here the north had no such impulse (from diamonds and gold) as the south, and its Mediterranean neighbours produced the same crops (e.g. barley and olive), which minimized any tendency towards exchange.

But even in these more favoured parts of the continent there is little or no prospect of Africa containing any typically manufacturing area, or making any serious demand for manufactures. It will be, and should be, an exporter of raw materials, raised by native cultivators with, and under, the best European advice and help. Under these circumstances immense quantities of cotton and tobacco, cacao and palm-oil, could be raised, all of them of first-rate quality. The rubber, cotton, and cacao are already in the lands of the natives, and this fact has economic as well as moral value, for it solves the problem of *willing* labour.

Cotton. The cotton is the most widely distributed, and practically all of it—excluding Egypt—is on British territory, especially in Nigeria and Uganda. In Nigeria it has been grown for centuries, so that the people have a general familiarity with the plant; the dry season guarantees fine harvest weather; and the crop has an immediate cash value. But the dry season is so long that it limits the time for raising both food crops and the cotton, and the former naturally have first attention. Still, some of the areas are very fertile, transport is very fairly good, and the Semitic races (e.g. Fulani) and the Hausa speech (as a *lingua franca*) are great assets.

Uganda has similar advantages in the Baganda people and the Swahili tongue; and its facilities for raising large crops of very fine cotton are very great, while the food question is not a difficulty. Transport is worse than in Nigeria, but the problem is being solved—in both areas—by motor and railway developments, especially round Lake Kioga and Zaria.

Sisal. Since careful tests—for periods of 4, 6, 9, and 12 months' exposure—have proved that sisal is at least as good a fibre as Manila hemp for marine cordage, a great impetus has been given to the cultivation of it in East Africa, especially in Kenya; and in 1927 we imported more than 7,000 tons (compared with 50,000 of Manila hemp) from British East Africa (Kenya, Nyasaland, and Tanganyika). In 1929 Tanganyika alone produced over 36,000 tons.

Cattle. The typical native occupation, however, is cattle-rearing; but the total number of cattle in the whole continent is probably less than in the Plate basin alone, and they are not raised usually for sale or slaughter. The Fulani and the Masai measure a man's importance by the *size* of his herd, so that he is very unwilling to sell or slaughter any beasts. In the meantime, therefore, there is little prospect of any development of a meat industry outside British South Africa. And even there, during the reign of Queen Victoria, an order to slaughter beasts affected by rinderpest was interpreted by the Zulus as a deliberate challenge to war!

The Dark Continent. Africa owes its nickname to causes which are essentially geographical. It has less coast for its size than any other continent; and what it has is curiously lacking in gulfs and bays which might supply natural harbours. Deserts and disease have also checked the creation of artificial harbours; thus, for hundreds of miles along the west coast between the Senegal river and the Sus and along the east coast between Somaliland and Suez, the hinterland is stark desert, while for hundreds of miles along the west coast between Bathurst and Benguela and along the east coast between Mozambique and Mombasa it is wet jungle. These conditions so greatly impeded intercourse with other, more civilized, continents, that Man remained profoundly backward and uncivilized, in moral and economic "darkness"; and he was actually darker in skin than anywhere else in the world.

European Exploitation. This meant that he was almost inevitably bound to be a victim of the more advanced outsider, first the Arab and then the European; and the Arab influence was much stronger north of the equator than south of it, while European influence has been strongest in the parts farthest from Europe. The *per caput* export values to-day are highest for the Union of South Africa, followed closely by French North Africa (Tunis and Algeria); in both areas the value is twice that of Egypt; and the value for the whole continent is *scarcely* 5 *per cent* of that for even Australia.

There are three main causes for this. The first is the lack of transport—owing to the difficult access and the economic objections to constructing railways over deserts or through jungle. The second is the lack of efficient labour—owing to the ease with which primitive and elementary needs can be satisfied, and the consequent lack of any incentive to labour. The third is the general problem of health, as it affects Europeans as well as natives; the latter suffer *more* than the European, and this also affects the efficiency of what labour there is. Indeed, the average negro is a lifelong martyr to hookworm; and disease has been the main cause of the small population of the continent, which—with 66 *per cent* of the area of Asia—has only 14 per cent of the population.

We may add three subordinate considerations. The natural incoherence of the vast savannas greatly impeded any political coherence, and this favoured European intrusion. The lack of demands from the natives has complicated the economic problem. And the climate of the more productive areas makes it as difficult for the European to maintain his health as for the negro to develop intellectually.

CHAPTER XX

AUSTRALIA

AUSTRALIA resembles Africa in several ways. It is largely a vast plateau of very old rock, with its edges turned up, especially in the eastern belt, so that *from below* they look like mountains; and the eastern "divide" is often called—quite wrongly—the Great Dividing *Range*.

As the continent, like Africa, is mainly in Trade-wind latitudes, this turned up edge drains the S.E. winds of much of their moisture, so that the interior is largely dry grassland, merging in semi-desert and then in stark desert. The two regions are, therefore, somewhat alike in their products and occupations, especially in their natural dependence on animals and their need of irrigation.

The one advantage of Australia, its much smaller area, gives it a slightly better climatic relation to the ocean, but this does not compensate for its remoteness from the North Atlantic countries. The 12,000-miles journey delayed its discovery, and has so greatly retarded immigration that the total population is still only 6,400,000; but the oceanic isolation limited its early visitors to real seafaring peoples, while the smallness of the native population a century ago and its steady decrease have saved the continent from all the racial problems that have troubled Africa.

The oceanic isolation favoured a considerable independence of thought and action, and decided the kind or form (concentrated) of product that can be profitably exported; it also, by limiting the population, tended to give a relatively excessive importance to the individual, while it kept him too much out of touch with world culture.

Further, though we may gladly admit that very many of the early "convicts" were essentially—if not nominally—honest and honourable persons, grossly wronged by legal process, and that the gold-miners were exactly the right type of man to open up a new land, we must also admit that the "Botany Bay" political organization and the gold rush left an indelible mark on the people.

City States. Somewhat similar conditions in ages of very primitive transport evolved the ancient City State, which produced a definite proportion of selfish and bumptious individualists; but most of those ancient City States—whether in mountain-girt glen or sand-girt oasis—were abreast of the highest culture of their epoch, and inculcated a sane patriotism in their citizens.

One applies the term City State to these Australian States not because their areas are so small that there is no room for more than one city, but because the geographic isolation allowed the capitals to stand on the best possible natural harbours, quite regardless of the strategic merits or demerits of the position. So, from the first, the single centre attracted a maximum of trade and, therefore, of people, including all immigrants; and it is in such spots of dense population that the political machine can be most effectively "bossed." To-day about 47 per cent of the New South Wales population is centred in Sydney, 53 per cent of the Victorian in Melbourne, and nearly 60 per cent of the South Australian in Adelaide.

It so happened that the first great gold-rush was to the smallest colony, which thus received a large proportion of mining adventurers; and the typical miner, with some very high qualities, is so constantly facing risks of damage and death, and has hitherto been so highly paid, that he has—most reasonably—a very high opinion of himself. The smaller the population, too, the greater was the importance of the individual bound to be, and the results of these conditions are obvious to-day.

Wool. Arid lands are everywhere used more profitably for sheep-rearing than for any other purpose. Not only are sheep the most useful animals that can subsist on such lands, but they are also more healthy on them than anywhere else. Thousands of square miles in Australia—with a rainfall of from 10 to 15 inches per annum—are almost ideally suited to sheep, for the semi-desert salt-bush is both wholesome and nourishing, and the absence or scarcity of rain is actually beneficial to the wool, if not to the mutton.

Further, wool has high value in proportion to weight; it is one of the products which can fairly be called non-perishable—so far as storing and shipping are concerned; and most of the sheep have been merinoes, with heavy fleeces of very fine wool, some of it the finest in the world. But the introduction of refrigeration has encouraged the keeping of cross-bred sheep, which give much better mutton without much inferiority in the quantity or the quality of their wool; and the mutton—like beef, butter, etc.—can be landed in England at a total cost of about 1d. per pound.

The beef comes from the rainier north-east, the butter from the cooler south-east, and the fruit mainly from the "Mediterranean" areas in the south and the irrigation colonies in the Murray Basin. Wheat, which comes mainly from the same areas as the fruit, is the most important agricultural product, occupying more than half of the cultivated land, and its quality is excellent; but the yield per acre, though steadily rising, is still very low. The only serious rival to the wheat is likely to be cotton, the conditions being very favourable for rain-grown cotton in S.E. Queensland and fairly favourable for irrigated cotton in the Murray Basin.

But all farming activities have to face an unceasing struggle against drought. Except in the monsoon lands of the north (and in Tasmania), the rainfall is nowhere really heavy; in most parts it is very light for the latitude, and—worse still—it is subject to great fluctuations; reflected terribly in the sheep census, which showed a variation of 24,000,000 between 1911 and 1915, and one of 7,000,000 between 1927 and 1928.* More than half a million square miles in the hinterland of the eastern coastlands is underlaid by an artesian basin, and thousands of wells are at work; but the water is usually too saline to be used for crops.

Mineral Wealth. Though the gold "era" is past, the continent has produced over £500,000,000 worth of gold since 1851, and it has a great variety of other minerals, e.g. copper and tin, silver and zinc, iron and coal. Broken Hill is the chief metal centre, but the Newcastle coalfield is the great asset; indeed, it has made Australia the leading producer of coal in the southern hemisphere.

The demand for coal in industry, however, is limited, though the total value of manufactures is well above that even of the pastoral industry, if the *dairy* values are not included. The population is too small to make large-scale industry profitable in the meantime; and, though nearly 80 per cent of them live within 80 miles of the east and south coasts, the climate is not favourable to textile work. This leads to a high *per caput* import of manufactured goods; and, as the home production of staples is far in excess of the needs of the small population, there is also a very high *per caput* export—mainly of raw materials. Indeed, the *per caput* foreign trade has three times as high a value as in the U.S.A.

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* The output of wool in 1925 was 830,000,000 lb., against 774,000,000 lb. in 1924; in 1928 it was nearly 890,000,000.

Political Geography. The outstanding fact in the political geography of Australia is the people's obsession about a "White Australia." This, of course, means specially that Asiatics are not to occupy the monsoon lands of the north; but even dark Europeans are scarcely welcomed in the "Mediterranean" lands of the south. For every two Italians who entered in 1927, only one entered in 1928; for every two who left in 1927, three left in 1928. The number of Greeks and Yugoslavs admissible has been reduced from 100 to 50 *per mensem*, and that of Poles and Czechoslovaks to 25. This does not mean that the people are blind to the danger of a very small White population in such a very large area, but only that they believe or suspect that any increase might affect the prosperity of the individuals already in the country.

The question of tropical colonization is taken up again in a later chapter, but we may comment here on the Government propaganda about these northern territories. We know about the "conquest" of malaria and about similar advances with regard to tropical hygiene generally; but in such a connection it is absurd, if not worse than absurd, to use the word "disease" in a sense which does *not* include the neurasthenic effect of bright light. This is just as great a danger in the dry season as the high (wet-bulb) temperatures are in the wet season, and it is exceedingly improbable that *British* settlers can survive and propagate their race *true to type* in northern Australia.

For by a White Australia the mass of Australians mean a British Australia, even though the third generation (of pure British breed) in New South Wales—in colour of skin and hair and eyes—look typically Neapolitan! And the population *is* British, 98 per cent of the total at the last Census being returned as "British-born."

But there is another side to the question, and the local problems are acute and difficult. Thus, the awards of the Arbitration Courts and the "concessions" (? bribes) to the Unions to prevent dislocation of industry have immensely increased the costs of production; between 1919 and 1927 the *value* of production increased by 137 per cent, while the *amount* increased only by 48 per cent; the horse-power per employee increased by 65 per cent, while the production per employee *declined* by 9 per cent.

Take the price of coal. Coal from Newcastle, Northumberland, has recently been 35s. 6d. a ton in Adelaide against 42s. 6d. for coal from Newcastle, N.S.W. Indeed, the price of N.S.W. coal has increased by over 300 per cent in the past twenty-five years, mainly from class legislation.

From a slightly different, but essentially kindred, cause the price of necessaries *in* Australia is excessive; and the position has been getting worse since the export of, e.g. butter, sugar, and fruit, became important. Thus, 38 per cent of the total output of butter is exported, and the cost of "protection" to the Australian consumer amounts to about £38 a ton. The percentage of sugar exported is usually over 40, but the cost of "protection" is less—only £7 10s. a ton. About 75 per cent of the sultanas are exported, and the cost of "protection" is £15 a ton. Of course, all this export has to face world prices, e.g. on the English market.

In the long run, the burden of this protection and of the class legislation falls on wool; and, owing to our difficult economic position, England is becoming a less favourable market for the wool. Indeed, it is a curious comment on Australian views about Asiatics that Japan is now one of their best customers for wool —as well as a large buyer of their increasing export of wheat (fully 20 per cent of total exports as a rule).

As the other great wheat exporter in the same latitudes, Argentina, has only 38 per cent of the area of Australia, with 166 per cent of the population, it is worth while analysing the geographical conditions very carefully.

PART VII

IMPERIAL PROBLEMS

CHAPTER XXI

GENERAL CONSIDERATIONS

So far our attention has been directed mainly to economic geography, and that aspect of the subject is obviously the most closely associated with the basis of industry, unless one interprets the word "industry" so narrowly as to exclude e.g. agriculture. But one can scarcely over-emphasize the fundamental fact that geography is a single coherent subject, and that the adjectives used to "limit" it suggest only slight differences of aspect and approach, not serious differences of subject-matter and principles. Further, the economic geography that is not firmly rooted in historical geography, must be unstable; for man everywhere and always uses first what comes to his hand, the natural product of his neighbourhood, It must also be unstable in an area that is not politically firm and coherent.

This makes it specially desirable not to ignore political geography—quite apart from any belief that "trade follows the flag." For to-day some of our most pressing problems are such that it is practically impossible to distinguish between the political and the economic factors involved.

European Control of the World. What, for instance, were the vital factors in the European control of the world? That is the most significant single feature in the political geography of the world, and we can trace it back to several distinct sources. Some of the emigrants were refugees from religious and political persecution; others were refugees from actual poverty or from want of a field for their activities. Both types were attracted to temperate regions that were thinly peopled, economically promising, politically unformed; and most of both emigrated from rural rather than urban areas. Thus, an impulse was given to the development of ocean transport—for passengers and manufactures outwards, with a strong probability that these rural refugees in their vast new regions would supply "temperate" foods as return-cargo to Europe.

To-day economic pressure is heavier than ever, thanks mainly to the increase and the urbanization of population in Europe; and while the development of temperate regions has provided both homes for Europeans and bread and meat for Europe, it has not satisfied all the needs of the latter, especially those of the most highly industrialized countries.

Tropical Regions. The attention, then, not only of Europe, but also of all industrialized areas elsewhere, has been directed towards tropical regions. These are certain sources of valuable foods, e.g. sugar and cacao, and of other raw materials, e.g. rubber and jute; they are possible homes for surplus population from overcrowded parts of Europe; and so they are probably and potentially new markets. For the real purchasing power of a tropical region depends largely on the percentage of its population that is sufficiently "civilized" —if you like, sufficiently pampered—to make effective demands* for something *more* than a mere minimum of what is necessary to sustain life.

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* In many tropical regions now, e.g. Cuba and Java, the native population are *ceasing to live on what they raise*, and so are forced to import food.

In the earlier days of this movement towards the tropics the most important aspect of geography was probably the political; and political geography was concerned specially with such things as "spheres of influence" and "natural hinterlands." To-day it is concerned with such things as hygiene and transport, i.e. distinctly economic rather than political concerns.

Africa. Though the problems are thus nominally changed, the regions concerned remain the same; and Africa is the most important continent. To start with, European penetration of the Dark Continent depended on the possession of certain points of vantage round the coast; and these were naturally most accessible to really maritime peoples, such as the English, Portuguese, and Dutch. The whole area which drained, literally or metaphorically, on the particular point, was known as the "Natural Hinterland"; and it became usually a "Sphere of Influence" for the particular Power that held the harbour.

All these spheres of political influence have now been annexed by or allotted to European Powers, and have also been more or less transformed into *Spheres of Economic Interest*; but the success or the failure of economic development in each case is closely bound up with the character of the political control, and in tropical Africa this has been mainly British. We may add, thankfully, that this British control has in most parts, especially in West Africa, been conspicuously enlightened—and *therefore* successful.

Imperial Trade. The significant economic fact is that a large proportion of the total trade of our Imperial political unit is *national* and *internal*; Britain trades very largely with the overseas parts of the Empire, and those parts trade very largely with Britain and to a considerable extent with one another. The medium of communication has been, necessarily, the ocean, which is far the cheapest medium in existence. Not only is the medium the cheapest possible, but the trade has the most significant feature of *international* and *external* trade—it is world trade. At the same time, it is free from the most obvious difficulty of international trade, i.e. the difference of speech, involving difficulties about letters and interviews, prices and catalogues. Nor is this all. For the common speech practically involves common ways of doing things, whether business or otherwise.

But there are two kinds of Imperial lands—the crowded, Britain and India, and the empty, the rest of the Empire; and one obvious method of adjustment might be found in the overflow from the crowded into the empty areas, the surplus from temperate regions going to temperate regions and that from tropical to tropical. The basal cause of the natural emptiness of tropical regions, especially in Africa and Australia, is climatic; and, therefore, the first problem to be discussed should be tropical *colonization*, in both its economic and its political aspects. Of course, the question whether citizens of the Empire, e.g. Tamils, should not be allowed access to various parts of the Empire, e.g. Australia, is one which geography is neither competent nor anxious to discuss; but the utilization of tropical areas is a very different matter, and one on which the typical politician is entirely incompetent, however anxious, to give advice. In the meantime, where White colonization is recognized as impossible, e.g. British Guiana, there is no difficulty; and where the climate has allowed the evolution of an effective Native organization, e.g. Nigeria—and where the European control has been wise enough to use this—there is very little difficulty.

Racial and Regional Values. At the same time, the problem is far from simple, if only because the different racial and regional types of man have "values" as different as those between different breeds of cattle. For instance, the type of colonist that the Dominions wish to get from us—and that, incidentally, we can least afford to lose—might possibly be compared with that finest dual-purpose animal in the world, the pure-bred Durham or Lincoln shorthorn, with brains as well as muscle, character as well as health. But there are other types.

There are, of course, just the same differences amongst the various peoples of our tropical territories; and the result is seen in both political and economic spheres. From our—possibly mistaken—standpoint, few of these peoples have reached a stage at which they can be trusted to govern themselves "wisely," still less one which equips them to share usefully in the common administration of the Empire. On the other hand, some of them have at least reached a stage, e.g. in Nigeria, at which their own historic organization can be adapted, or even adopted, by us as entirely suited to the particular region and circumstances. Others, again, while seeming to be politically impotent, may have evolved ways of doing things entirely suited to their domestic needs; for instance, the wells sunk in Hindustan by the poorest and most ignorant of Indian "soil-cutters" are quite admirable, and in the course of centuries have not done the harm to the soil, e.g. by bringing up salts that has been done in a few years by some of our irrigation works.

Careful analysis will probably convince us that both Nature and Nurture, the type and its environment, are responsible for these differences; and certainly climate is the most vital factor in the environment.

For instance, if we analyse the conditions under which there is difficulty in obtaining satisfactory labour in tropical Africa, we may find that a particular type of negro is constitutionally lazy, or that he has no incentive towards being energetic; but we also find that he is a lifelong martyr to the ravages of hookworm or some similar debilitating disease. We shall certainly find that what we mean by civilization or scientific method or "common sense"—as products of European conditions—involves the African in ways of life and work that are utterly alien to his heritage.

Dangers of Ignorance. This is probably where the political or religious or "scientific" fanatic makes his worst mistakes. No millennium can be manufactured in a minute; progress must be slow—slow enough for the new habits to become "second nature"; and great care is needed against making foolish changes.

For instance, what European politicians may consider an ideal form of government, would probably be wholly inappropriate in tropical Africa or even in India, as what some missionaries consider decent dress would be extremely unhealthy. We may assume that the most intelligent and best educated people in a country are the most likely to be articulate, even clamorous. But, if in any given country they were notoriously deficient in all virile qualities, and yet would have to try to govern some of the most virile people in the world, it would be crass folly, if not actually a crime, to extend the government to them. Our danger here lies in the appalling ignorance of our politicians about distant lands.

A similar danger may be due to sentimentality. Every right-minded person must rejoice at the success with which we have been striving to curb famine and disease in India; but how many are willing to admit that, unless and until we make equal efforts to delay marriage and restrict births, such efforts are very foolish, if not actually criminal? Their direct result can only be to make the over-population very soon worse than ever.

Complementary Areas. The world-wide distribution of the Empire is a great asset in relation to complementary climates and seasons, e.g. between Tasmania and Scotland; and these, as a natural basis for exchange, are of special value to a commercial Empire. But we must remember that, though our tropical areas have these complementary climates and products, they do *not* in the meantime make much effective demand for the products which our temperate areas—specially the Mother Country—can offer.

CHAPTER XXII

DISTRIBUTION OF MAN-POWER

ONE of the pressing problems is the redistribution of our imperial population, and it must be approached from an imperial standpoint, i.e. with full regard to the safety and prosperity of *all* parts of the Empire; and, as we have seen, there are two areas overcrowded, while all the rest are under-populated, some of them seriously so.

The White Population. The redistribution of the White population is more pressing and more important at present than that of the Coloured; and, roughly, what is needed is the transfer of a large number of *average* families from the Homeland to temperate regions in the Dominions, and that they should be families with *young* children. As the latter grew up, they would easily absorb the new atmosphere, and fit unconsciously into the new conditions. In the last century we lost 10,000,000 of our best citizens to the U.S.A. alone, i.e our greatest economic rival. As the population of the Empire outside the Homeland (with its 480 to the square mile*) averages *only six* per square mile, this loss is greatly to be deplored.

The one necessary precaution is that the emigrants should be *average*; we cannot afford to lose all our best citizens or all of one type, and the Dominions do not want all our worst citizens or only urban types. The decrease of unemployed in the one area and the increase of employed in the other would lighten the total, or the *pro rata* burden of, rates and taxes in both areas; they would improve the standard of wages here, and increase production there; they would improve the health of our people—in empty new lands or in *less* crowded old ones; and, as a large proportion of the increased production overseas would be food, the food supply of the Empire would be increased, and that, too, under conditions favourable to the rise of new markets for our home manufactures.

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* For England (and Wales) alone it is 650 (80 per cent *urban*).

That is the general position, but there is a further special aspect to be noticed, the need for special migration of women. This is a delicate, but vital, problem. In the past, owing to the unfavourable conditions of life in lands that were very "new," the number of women emigrants was sadly limited in regard both to total and to particular types. There are, of course, thousands of women whose aim in life is not marriage; but there are still more in this country who have no chance of marriage, because for every 1,000 males born, there are 1,060 females. Now that life overseas has become "normal," and that women have complete emancipation from political and economic chains, the Empire wants them everywhere—for both professional and domestic spheres—300,000 of them in Canada, 100,000 in Australia, 30,000 in New Zealand, etc.

At the same time, the attitudes of the Homeland and the Dominions to the problem are naturally quite different. For instance, to us probably the most important question is the need for new markets, by which we can expect to maintain and even to expand that export trade on which our power to buy food for our home population depends. To the Dominions probably the most important question is the need for security—e.g. security from a racial danger in South Africa, from an international danger in Australia, from the economic political attraction of a great and very successful neighbour in Canada.

An Imperial Survey. But, though the attitudes to the problem may be different, the desirable preliminary is the same for both—a scientific survey of the Empire as a possible home for its people; and probably this is even more needed here than overseas. For the Empire is, politically and economically, oceanic; and we have depended on the ocean for political security and for economic prosperity. And our sub-consciousness of this has tempted us to depend on oversea sources of necessaries, and to neglect the tiny, but vital, home supplies until we no longer even attempt to grow enough "bread" to satisfy our needs even for a dozen weeks of the year. Mr. Churchill's notorious motor park at Slough still cumbers, in a different form, some of the best wheat land in England!

If we added 8,000,000 acres to our arable area, and settled 250,000* men and women on them, we could guarantee four-fifths of the adequate minimum of wholesome and nourishing food for our whole population. If we imported the quantity of "meat" represented by the beasts now fed on those 8,000,000 acres instead of raising it here, we should save enough to pay the whole cost of the "dole." For even the pig, by far the most economical "converter," consumes 3,000,000 tons of potential human food to produce ("convert" it into) only 250,000 tons of—less nourishing, if more tasty—pork, ham, and bacon.

The survey of the overseas Empire would be of a different kind, and much of it has been done already—accidentally or incidentally. For it is a World Empire, and includes all the great types of Natural Regions. Each of these has its typical products, and the various regions have complementary seasons or climates.

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* This is only the population of a single town, such as Nottingham or Leicester.

For instance, the Temperate type, as seen in Canada, has maritime margins and continental interiors; and the margins are as well suited to the growth of forests and dairy pastures as the interiors are to that of wheat and other bread-stuffs. The Trade-wind areas are, similarly, partly maritime and partly continental; the former already produce the best coffee and sugar in the world, in the West Indies, and large quantities of fruit and tobacco; the continental savannas could produce immense supplies of cattle and maize, and large supplies of fine cotton and tobacco.

It may, indeed, be said confidently that the Empire could produce (1) all the bread-stuffs we need (wheat, oats, barley, rice); (2) all the tea, coffee, cacao, sugar, and oil-seeds (margarine); (3) all the beef, mutton, pig, and rabbit products; (4) all the wool, rubber, jute, and sisal, and at least half the cotton; (5) all the most important kinds of timber; and they could all be produced in the Empire probably *at less cost* than we have to pay for them now.

If vast spaces in the Empire remain undeveloped, we shall lose our moral right to them; if they are developed, they will make the Empire more and more self-supporting in essentials; and the most important of these essentials, e.g. bread and meat, will be produced under conditions favourable to the raising of our physical standard. When we remember that there are several million more persons engaged in agriculture in France alone than in the whole Empire, *apart from coloured labour*, we may realize how large a field we have for escape from narrow city streets and smoky skies. And in a world empire there ought to be enough variety to suit everyone.

The Coloured Population. The case here is very different, and India is the only region that is seriously over-peopled; and even in India the problem is not obviously acute, because the standard of living is so low that the country is still largely self-sufficient, or could be so. But, with the decrease of famine and disease, the pressure of population is increasing; and a little foresight could save a world of probable mistakes. Cf. page 174.

For one thing, any organized migration from India *need not* be to a Dominion, even though some of the Dominions would profit greatly by such a movement. What possible "harm" could it do to the Australian in his lonely continent if Borneo and other tropical islands "near" India were developed by Indian labour? It ought to make him feel actually safer from any intrusion of "foreigners" from north of those islands.

From a different point of view, too, we are apt to be misled by the party propagandist or the plausible sentimentalist "We are too cowardly to protest against our coloured brethren being shipped off in thousands like cattle to toil beneath alien skies." The words sound noble, but they imply crass ignorance of contemporary events, e.g. of the recent *treaties for exchange of population*. By these treaties people have been "shipped off in thousands" to new lands—50,000 Greeks from Bulgaria and 100,000 from Anatolia, 300,000 Turks from Macedonia, etc.

Of course, the "wholesale" migration of Indian *coolies* is not a new phenomenon; they were invited, two generations ago, to Natal to work on the tea and sugar plantations, and have been found to be "good, law-abiding, quiet citizens." But even in Natal there has been trouble, still more in the Transvaal; and it seems—to a geographer—to have been largely due to unscientific treatment of the problem.

The attitude of the Union as a whole is that White men in a Black continent must not further complicate a difficult racial question; it is dictated more by fear than by intolerance, and is affected by the *misuse* of an economic opportunity. Natal needed agricultural labour, and imported it *indentured* from the ranks of Madrassi peasants. When these men and their children were given the opportunity (in 1921) of being repatriated to India, *they would not go* But in Natal and in the Transvaal there are many "Arab"—really Bombay Moslems or Bengali Hindus—traders, and these are responsible for practically all the trouble.

Even political geography is, fortunately, not concerned with the very difficult task of deciding the relative justice or wisdom of "reservation territory," "restricted movement," "franchise rights," etc.; but the rest of the problem comes naturally within the sphere of economic geography. Every natural region has its *natural* flora and fauna, closely dependent on the regional climate. In one region, for instance, the *natural* transport-medium is a mule, in another it is a buffalo, in a third it is a machine. To use a horse in the tsetse-fly belt, when you can use a machine, is folly, even if motor roads and railways have actually helped to spread disease by facilitating communication; to use a railway for the insignificant traffic of a glacial valley in Tibet or Bolivia, when you can use a yak or a llama, is equally foolish.

India contains 60,000,000 patient and industrious peasants who are denied—by their own Hindu people, but, of course, *not* in British law !—even the usual rights of human beings, e.g. access to a public water supply; and these "pariahs" are entirely suited, and urgently needed, for the development of much of our tropical Empire—under the supervision, i.e. the sympathetic care and the scientific guidance, of White people. The verbose and cunning Bengali trader is useless for this purpose, and is not needed for any other purpose, e.g. trading. The one type should be invited and welcomed; the other should be neither invited, nor admitted, to the areas in question. Then, too, the Hindus left in India—having none of their own folk whom they would not recognize as normal human-beings!—would be in a much stronger position to claim from us various political and other "rights."

CHAPTER XXIII

OUR PROBABLE ECONOMIC FUTURE

We may bring this little survey of the Empire to a close by looking directly at the economic future, and asking a double question: How far, and in what way, can geography contribute to any forecast? The answer seems to be that the most helpful thing that the geographer can do is (1) to try to indicate the vital geographical problems in various regions, and (2) to suggest any means of solving them.

Whatever may be the ultimate verdict of medical science on tropical colonization, it is fairly certain that our British stock does best in temperate latitudes; and the explanation of this may be largely psychological. For a new land seems most clearly a land of hope and promise when it is new only in the absence of old difficulties—political, social, religious, economic, and otherwise, while the essentials of the environment are familiar and normal, especially in the degree of climatic strain on the bodily and mental powers. The urgent problems, then, for our home population, are those found in the temperate regions of the Empire.

Canada. Except with regard to population, Canada is in the proud position of being abreast of most of her internal problems; and even with regard to the population there are sources of satisfaction. From the purely internal standpoint, the repudiation of the ancient faith in France and her adoption of republican forms have helped to bridge the natural gap between French and British in Canada. At the same time

British stock has increased relatively till it represents now over 55 per cent of the total population, and French stock has decreased to under 28 per cent. Other, i.e. alien, stocks have also decreased slightly—to about 15 per cent. More than 50 per cent of the French Canadians speak English; and, though not 5 per cent of the British Canadians speak French, real efforts at bilingualism are being fostered. The number of French immigrants is negligible; the largest number is from England (c. 33,500 a year), and that from the U.S.A. stands next (c. 30,500).

The last Census showed a rise of 22 per cent in the population during the decade, but the net increase of population is scarcely satisfactory; for only the four western provinces increased in relative importance, Alberta and Saskatchewan having an increase of about 57 and 54 per cent respectively. Elsewhere only the extreme North-West Territories (23 per cent) show any substantial rise, and any growth has been of the towns at the expense of the country-side. This is so marked that to-day actually 50 per cent of the total population is urban.

Of the two external problems, Mongol immigration is a thorny political question, and the U.S.A. use and misuse of the St. Lawrence has already been mentioned. In both cases the probable future depends on issues outside our Political Geography.

The supreme economic interest is the production of breadstuffs, especially wheat. During the present century the wheat acreage has been increased by over 300 per cent, and the yield by over 600 per cent—for 1928 by over 800 per cent (to 550,000,000 bushels), which means 40 per cent of the world's export. And as the new "Garnet" wheat ripens in 10 days less than "Marquis," the crop can now be pushed still farther north. The farther from the equator wheat can ripen properly, the better is the grain.

New Zealand. As Canada has rightly specialized in "bread," New Zealand is rightly specializing in "butter"; and so, like Canada, the Dominion is abreast of the vital problem.

There are no pressing problems in the political geography. While holding the same general attitude as Australia to developments in the Pacific, New Zealand has not any of the special difficulties associated with Northern Australia; and, while combining two distinct racial types, she has none of the difficulties felt by Canada. The Maoris, though steadily increasing in number and maintaining strongly their individuality, only total about 66,000, i.e. not much more than 4 per cent of the whole population; and, exclusive of them, fully 98 per cent of the population are "British," 75 per cent of them having been born in New Zealand.

The most important feature of the economic geography is the development of the dairy industry, an entirely right step. In this "Britain of the South" the climate is as favourable to English grasses as to English people.

The historic animal, of course, has been the sheep—a dual-purpose sheep—and wool is the second, and meat is the third, product on the export list; and New Zealand comes second for wool and first for tallow on our import list. But the special development is in the production of butter and cheese, casein and dried milk; and agriculture (turnips, mangolds, lucerne) is becoming a handmaid of pasture, the wheat area having fallen 50 per cent in a dozen years. The industry is admirably organized, largely on a co-operative basis, with the strictest scientific attention to the breeding and feeding and milking of the cows.

This has rather complicated the sheep business, and a further complication has arisen through the greatly increased demand for *lamb*, for it is difficult to satisfy this demand (averaging, perhaps, 1,140,000 carcasses a year!) without sacrificing too many ewe lambs, and so restricting both the future number of sheep and the adult wool crop.

The successful application of refrigeration to the carriage of dairy products and meat has encouraged its application to other products, e.g. fruit (apples), eggs, honey, etc. ; but these are "allotment" industries, and, though very valuable locally and to immigrants with little capital, they are quite secondary. In any case, too, though relief and climate are very favourable to the supply of hydro-electric power, the remoteness of the Dominion has so restricted population that it is insufficient for any great industrial development.

Union of South Africa. Apart from half of the South-West Africa Mandate and a small strip of the Transvaal, the whole of the Union is not only within temperate latitudes, but has a large proportion of its relief high enough to make the climate, even in the lowest latitudes, quite temperate. At the same time this plateau relief, as usual, favours a dry and sunny climate, with relatively high temperatures.

The directly economic problems are simple. The mining industry holds a unique position, for—thanks largely to the existence of good and cheap coal in a region where there are practically no navigable rivers—the Union is the chief source of the world's supply of both gold and diamonds; but the ultimate prosperity will depend on agriculture and pasture, especially the production of maize and of wool (and skins). In both the mining and the farming, however, the great bulk of the labour is Coloured, the Whites confining themselves to skilled crafts and to supervision of the Coloured labour; and where—owing to a very treacherous climate of "drought *or* flood"—White *farmers* have failed in farming, and lost their lands, a very difficult problem of "poor Whites" has arisen, very difficult especially because they tend to interbreed with the Bantus.

The chief problem, then, is really political and racial, though it seems to be economic and moral. The climate is suitable for White people, and they have had footholds in the land for two centuries, and their Afrikander type is virile and efficient; but—excluding some 750,000 Bantus in the territories under the Colonial Office—the Bantus are three times as numerous as the Whites. As the Union cannot absorb the average British emigrant, the White population cannot increase rapidly, while the *Pax Britannica*—with its sanitary and "charity" *régime*—allows the Bantus to increase faster than ever before.

In the meantime the Whites are controlling the situation as supervisors of what is little better than Helot labour, and as members of an exclusive parliament; but education is enabling the Bantu more and more to do skilled work and to enter trades, and the White man cannot compete on equal terms with the Black man—because he cannot live on the lower standard.

Segregation may—or may not—be the right solution of the difficulty, but it should be discussed without sentimental propaganda. There are already, and have been for years, areas in South Africa—some of them very fertile—where Whites have been forbidden to settle or even to acquire interests, e.g. Basutoland; it cannot be illogical to earmark other areas where Blacks may be excluded.

Australia. The essential problems are being successfully solved so far as political conditions allow. Australia is far the most important exporter of wool, and the mass of the output comes from the temperate latitudes. While the world number of sheep has decreased by 70,000,000 on the pre-war figures (650,000,000) and the total clip by 3,000,000 lb., Australia has almost maintained the pre-war figures of both (75,000,000 and 705,000,000 lb.*); and the use of artesian water for the drier lands and of chemical manures for the poorer soils and very careful attention to breeding are making her position still stronger, the breeding having increased the clip per sheep by over 200 per cent (7 lb. per sheep) in 50 years without any loss of strength or length. There has been a trifling loss of fineness (e.g. for crepons and other thin materials for ladies' wear), but for most fine purposes Australian " merino " is still supreme.

There is a similar admirable record for wheat, for the crop has been steadily pushed into drier areas—freeing coastal areas for other purposes, e.g. the raising of mutton and lamb or the production of milk—along with an actual *increase* of the average yield; and wonderful progress has been made in the raising of fruit, especially raisins and sultanas.

Tropical Problems. From the standpoint of political geography our special problems in the tropics are racial; they are closely associated—especially in Australia and Kenya—with the question of tropical colonization, which we have already surveyed, and usually distinct from the racial question as it appears in South Africa. From the standpoint of economic geography, our special problems are associated with agriculture and transport; and the two are closely connected, for (1) it is largely the greater facilities of communication that have spread plant and animal diseases, especially in Africa, and (2) the mining centres that justified the transport, have become an immediate market for the foodstuffs.

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* The clip in 1927 in N.S.W. alone was 500,000,000 lb., but it fell by 65,000,000 in 1928. In 1929 the total number of sheep in N.S.W. was nearly 53,000,000.

The initial difficulty is in the fact that the ideas behind all the political and economic measures taken to develop these tropical areas came from the natives of temperate islands, with a traditional culture and experience quite alien to a tropical environment. How largely we have succeeded in this attempt to carry insular principles into continental areas, and temperate-zone habits into tropical regions, may be gauged from the fact that even in India our political and economic traditions are now part of the heritage of the native peoples.

This means that, except where there is deliberate activity against our control—whether provoked by our blunders or engineered by enemies—the "consent" of the governed will become more and more "natural," and so there will be less and less friction; and, as a matter of fact, though the peoples in our tropical territories are in a position usually inferior to that of those in our temperate territories, they are in one superior to that of peoples in similar areas belonging to other Powers.

One reason for this is probably to be found in the elasticity and the diversity of our control, e.g. contrasted with the rigidity and the unity of the French. Their administration is successful to a remarkable degree, but ignores natural differences of environment; every territory is a part of France, and all natives are to be Frenchmen.

Our system is far more geographical, even if unconsciously so; we see that environments differ, produce different types, and need different treatment. Everywhere, but specially in Africa, we are trying to leave the particular people in a "natural" state, with their own historic culture; we certainly do not impose on them a novel and alien culture because it is British; we try to show them what elements in our methods are, or might be, suitable and helpful to them, and then leave them to adopt what they like. They do adopt a great deal, largely because the mass of the people are quite satisfied that we are trying to help them, even if we make mistakes about the problem.

Education and Land Tenure. But about the two main planks in our policy there can be little doubt that we are absolutely on right lines, and *therefore* are succeeding almost beyond belief; these two are education and land tenure. Our old "literary" system of education, so often adopted by officials and missionaries, was as unsuited to negroes as much of our own elementary system has been to us at home. The aim now is to bring science and art into their traditional methods of agriculture and craftsmanship, of house-planning and sanitation; and the end is happier and healthier lives.

Most success has been won, naturally, where the people were already most advanced in culture, e.g. in the Gold Coast and in Uganda. In each case we rely on native rulers and native culture, on communal or private ownership of land, on an established tribal system, etc. The native peasant proprietors in the Gold Coast, unaided except by scientific advice and improved transport, supply half the world with cocoa; under exactly similar auspices the native peasant proprietor in Uganda is producing the largest crops of fine cotton in the Empire. They do not resent or question our control; they welcome the scientific advice even before they fully understand it; and the economic result is admirable. Wherever, and as long as, such relations prevail, the future is full of hope.

At the same time there are some areas where the natives are too backward for this, where they have little or no traditional culture or tribal organization, and where they cannot at present understand the advice given or the need for the supervision imposed, e.g. on the movement of infected persons or animals or on the use of water of which the unhealthiness can only be detected by the microscope. In these cases a nauseous sentimentality may see "tyranny" in our control, but that is disproved by the widely spread co-operation of the natives in "plantation" and similar material steps to advancement.

Air Survey. It is precisely in these very backward (generally forested) regions that some of the most useful scientific work has been done—by air survey. The time and the expense needed for ground survey, where that is even possible, have been hitherto prohibitive; but an air survey can be made over a large area at very little cost and very rapidly, and will reveal the whole *general* condition—from a height of some thousand feet. Then, wherever this photographic reconnaissance reveals curious or suggestive phenomena, e.g. a sudden absence of vegetation, a detailed photograph—from a height of some hundred feet—may show, e.g. mineral oil on the surface, destroying the vegetation. Such surveys have proved of immense value in railway work, e.g. in British Guiana—in search for minerals, e.g. on the Congo border of Rhodesia—in approaching valuable timber areas, e.g. on the Irawadi delta—and even in the discovery of illicit stills and surreptitious exploitation in more accessible areas.

Material Development. In most cases the first aim should be, and is, the improvement of the *material* conditions, e.g. the production of necessaries for local and foreign use, especially foodstuffs. Local needs for food are largely supplied by the "cheaper" cereals, fruits, and roots, e.g millet and yams, and these do not enter into commerce much at present except in their finer qualities; but if the natives learn to produce finer qualities, they will be both better nourished themselves, and have also a "cash" surplus for export. This sort of material—not materialistic—development is the right approach to cultural and political development.

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CHAPTER XXIV

CONCLUSION

THE business of a primer is simply to give a survey of a subject and to suggest an attitude of mind to it, not to replace a textbook or try to give a body of knowledge; and that is why Asia has been more or less ignored in this little book, for the problems in its economic geography are either too wide or too narrow. But there is one aspect of it which may serve to bring our survey to a conclusion.

We have emphasized here and there the unity of the subject and the diversity of the minds studying it, and have noticed that, whatever the particular aspect—political, historic, economic—we have to deal with the same essentials, the same features and phenomena, taken in the same order and put into more or less the same relations.

The one difference seems to be a slight difference of emphasis or of interpretation. Thus, in historical geography, one may be thinking of fuel only as a means of scaring wild beasts or of torturing enemies, and of the fuel-users as cannibals living in caves; in economic geography it will be associated with "power," and its users will be machine-bred people "living" in factories.

Even within a single aspect of the subject, however, there are varied ways of approach and of treatment, appealing to different minds; and, just as many good historians do not see in history much more than a series of biographies, so a good geographer may be primarily interested only in economic products—natural or artificial, raw or manufactured. Botanical, geological, or mechanical tastes may be behind the choice; and they may be freely and fully encouraged so long as the work is geographical, not statistical.

To such minds Asia may be the most interesting of all the continents for the very reasons which exclude it from a primer; everywhere one is faced with immense size and immemorial age, neither of which can be "summarized"!

For instance, to grasp the problem of transport one has to make a serious study—not merely a survey, which will inevitably mislead—of the size and the relief of the continent. As we have seen (page 53), it is far the largest continent in the world, its nucleus is the vastest mass of plateau in the world, and that plateau is buttressed by the highest mountains in the world. Serious study of a really good physical map, on an equal-area projection, is needed to understand, e.g. the complete dissociation of lowland Asia from peninsular Asia; or the immense longitudinal extension of that lowland, nearly double that of North America; or the height and the steepness of the plateau scarps, far worse than in Africa; or the fact that the limit of "lowland" here is the 3,000-ft. contour, not the 600-ft., as in South America.

So, a mere survey means that the direction of the great rivers east of 100° E. *draws away* your attention from the vital change of direction (in that longitude) of the fundamental feature-lines—from the Old World or Atlantic east-and-west trend to the New World or Pacific north-and-south trend, with supremely important results, e.g. on the gradients of the rivers and the access inland of rain-bearing winds.

Even the best relief map, too, must be supplemented by maps showing structure and physical history, e.g. showing the limits of the Dekkan trap, with its "black cotton-soil"; or Siberian glaciation, with its legacy of such moisture-content in the soil as can support the Täiga in an almost rainless climate; or the yellow dust of the Hwangho basin and the red mud of the Yangtse basin, with their incredible fertility; or the sticky volcanic soil which *forbids* successful rice-growing on the largest plain in Japan (S.E. Hondo).

Climatic questions in Asia offer the same fascinating intricacy, and demand the same detailed analysis. Thus, study of *monthly* maps is necessary to understand, e.g. how the Punjab wheat crop depends on spring rains brought from the Atlantic by perfectly normal S.W. Anti-Trade wet winds, with their accompanying cyclones; how the Bengal rice and the Assam tea crops, like their jute crop, depend on spring rains off a high-pressure circulation centred on the Bay of Bengal; how the Madras rice crop depends on rains off normal N.E. Trades; how the Japanese tea crop depends on snow off N.W. monsoons in winter; and how the normal temperatures between Baluchistan and Japan *fall* (owing to the rise in humidity) as the sun rises higher in the sky.

Far too many people do not realize that "monsoons" blow into Asia and out of Asia from, literally, every point of the compass; and far too many do not relate the pressure map to the relief map, especially in winter. And so they believe that Tibet—where altitude keeps the barometer normally *below* 15° !—is the centre of the vast area of *very high pressure* which does cover a huge area of Asia in winter, giving "stone-dry" winds outflowing in all directions. But even a map showing pressure and winds in winter does not, at a glance, suggest that the rotation of the earth gives such eastward projections of the coast as Korea and Annam —like such "leeward" islands as the Japanese—rain and snow off these "stone-dry" winds after they have crossed the various belts of sea.

Of course, everywhere climatic phenomena must be related to relief; but when the relief development is at a maximum, and size causes a maximum interference with normal planetary circulation, the necessity for relating the two is also at a maximum. But the relief must be also related to structure, and again this seems to be of special importance in Asia. For instance, the fertility of the great deltas of peninsular India depends directly on the relative amount of the Dekkan trap that is included in their basins.

Perhaps the two products which are at once generally recognized as typical of Asia, and which are also widely distributed in Asia, are tea and rice, the one specially as a highland and the other as a lowland crop, though there are both highland and lowland crops of each. Indeed, the difference of relief has sometimes great influence on the quantity and the quality of the product, e.g between Darjiling and Chittagong. The relief of the former is just as favourable to the distribution of rain and the quality of the tea as it is unfavourable to transport and to the quantity of the crop, though the two areas are only some 400 miles apart, and have about the same *total annual* rainfall (over 100 in.).

The two products are alike in their love of alternate rain and sunshine, so that they do best in the "pelt and pause" *régime* of a monsoon climate, and in their need of skilled cheap labour, such as is typical of an old land, where the experience of centuries has been handed down. But the one is a perennial bush, which, like tobacco, has its value in its leaf; the other is an annual grass, which, like coffee, has its value in its fruit.

Though both are grown in Russian Asia, the one on the southern foothills of the Caucasus and the other on the irrigated flood-plains of Turkestan, they are specially associated with what is so often called Monsoon Asia. The title is a deplorable one, for it suggests that only the south-eastern quadrant of Asia has a monsoon climate, and that there is only a wet monsoon; but it does also suggest an old land, with a dense population—largely of vegetarian diet—and with heavy rain and bright sunshine.

In both cases we need to relate the crop to relief, rainfall, temperature, labour, and transport; and, if this is done carefully, we get a most useful grasp of the whole geographical environment, especially if we have compared and contrasted e.g. the tea with coffee and the rice with millet.* But it is the details that are specially significant.

Thus, the dry kernel and the damp-proof husk enable rice to be stored for eating where it is grown; and this throws light on (1) the density of the population in typical rice-growing areas, and (2) the fact that the great producing areas are not the great exporters (cf. U.S.A. with Argentina in the export of maize). Exports can come only from areas where the geographical conditions are very favourable to the plant, e.g. continuous high temperature and unfailing rains, but where the political conditions have been adverse to dense population; the political history accounts for a thin population, while the geographical conditions guarantee a surplus of rice. It was the *Pax Britannica* that gave Burma control of the rice-market of the world; and French influence has had the same good effect in Indo-China.

Rice is found in surprisingly high latitudes, e.g.

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* With approach to rough relief, poor soil, scanty and precarious rainfall, millet naturally supplants rice as the staple, though "bird-seed" is not an ideal food for human beings.

45° N., because some kinds can complete their whole life-cycle in 120 days; and the quality of the grain, as with wheat, etc., improves with distance from the equator, because the higher latitude means both a slower rotation of the earth and a longer summer day. Now, tea is naturally a much hardier plant than rice, and yet its value—if not actually its quality—increases with nearness to the equator, because the vital needs for *leafage*—besides plenty of humus in the soil—are for a continuous high temperature and continuous showers, while quality can be improved by manuring with phosphoric acid and potash. Thus, the leaves can be picked thirty times a year in Ceylon, which practically guarantees that none are *old*, but only three times in China.

Then why is China the chief *grower* of tea in the world? For all kinds of different reasons, at some of which we may glance. For instance, it is a very old land, which has been tilled for thousands of years—with manures—until it is impossible to find a drop of pure water anywhere; water-drinkers in China died out centuries ago. Then it is a densely peopled land, where skilled and careful labour is dreadfully cheap; and this is essential in picking tea, as in picking cacao. "God gives only one good crop of cacao in every two years" should be translated, with a shifting of the blame, into "Negroes are so clumsy that, in picking this year's fruit, they knock off next year's buds."

China has also abundance of hill country where the soil is light and friable, and yet with enough humus in it to be rich and not too porous; it has the typical monsoon combination of heat and moisture, which promotes quick growth; and, as we have seen, it has a huge market on the spot. But none of these in itself is as important as the relief of the "Bohea" region.

For the whole south-eastern quadrant of the country is threaded by a concordant mountain system lying S.W.–N.E., i.e. at right angles to the direction of the wet monsoon there. This brings, of course, the typical monsoonal cyclones at the regular intervals; but, as the wind works inland, range after range provokes orographic rains in what would be otherwise "dry" intervals.

But the moment that world markets come into question, China is left far behind—even behind Japan! India produces only 25 per cent of the world's tea, but it does 48 per cent of the export trade; and Ceylon, with twice as many pickings in the year as even Assam, does 26 per cent of it.

These rather disconnected comments are intended not in any way to discourage those who are inclined to specialize on products in their geography, but only to suggest that such specialization must be geographical. Lists and figures are perfectly useless for training or for examination purposes; but just as good training, and just as wise preparation for examinations, can be assured by working back from the product and the people to the climate and the relief, as by working in the opposite direction. On the whole, those who have worked out products in a truly geographical study probably have *the best* picture of the area; and the whole business of geography is to teach one to visualize lands and peoples beyond one's horizon.

Finished
Feb 1, 1947
G. M. Sod. Parvay,

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This index is, of course, not intended to be verbally complete in any way; no attempt has been made to give *all* the references, even for the most important entries. The object is simply to give some help as to the method and the matter of the book.

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